











# RECORDS

## OF

# THE GEOLOGICAL SURVEY OF INDIA.

---

Part 3.]

1925.

[September.

THE MINERAL PRODUCTION OF INDIA DURING 1924. BY  
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### CONTENTS.

I.—INTRODUCTION—		PAGE.
	Total value of production. Mineral concessions granted . . . . .	242
II.—MINERALS OF GROUP I—		
	Chromite ; Coal ; Copper ; Diamonds ; Gold ; Iron ; Jadeite ; Lead ; Magnesite ; Manganese ; Mica ; Monazite ; Petroleum ; Ruby, Sapphire and Spinel ; Salt ; Saltpetre ; Silver ; Tin ; Tungsten ; Zircon . . . . .	244
III.—MINERALS OF GROUP II—		
	Alum ; Amber ; Apatite ; Asbestos ; Barytes ; Bauxite ; Bis- muth ; Building Materials ; Clay ; Fuller's Earth ; Gypsum ; Ilmenite ; Kyanite ; Ochre ; Serpentine ; Soda ; Steatite ; Zircon . . . . .	271
IV.—MINERAL CONCESSIONS GRANTED DURING THE YEAR . . . . .		279

## I.—INTRODUCTION.

THE method of classification adopted in the first Review of Mineral Production published in these Records (Vol. XXXII), although admittedly not entirely satisfactory, is still the best that can be devised under present conditions. As the methods of collecting the returns become more precise and the machinery employed for the purpose more efficient, the number of minerals included in Class I—for which approximately trustworthy annual returns are available—increases, and it is hoped that the minerals of Class II—for which regularly recurring and full particulars cannot be procured—will in time be reduced to a very small number. In the case of minerals still exploited chiefly by primitive Indian methods, and thus forming the basis of an industry carried on by a large number of persons, each working independently and on a very small scale, the collection of reliable statistics is impossible, but the total error from year to year is not improbably approximately constant and the figures obtained may be accepted as a fairly reliable index to the general trend of the industry. In the case of gold, the small indigenous alluvial industry contributes such an insignificant portion to the total outturn that any error from this source may be regarded as negligible.

The average value of the Indian rupee during the year 1924 was 1s. 5½d.; the highest value reached was 1s. 6¾d., and the lowest 1s. 4½d. The values shown in table 1 and all following tables of the present Review are given on the basis of 1s. 4d. to the rupee for 1923 and 1s. 5½d. to the rupee for 1924, the latter value being taken for case of calculation as equivalent to Rs. 13·9 to £1, instead of Rs. 13·913.

From table 1 it will be seen that there has been an apparent increase of over £3,600,000 or about 14·6 per cent. in the value of the total production over that of 1923. The value figures, however, are somewhat artificial and are in part due to the higher average value of the rupee during the year. In some instances, although the output has fallen in quantity, it has increased in value; such increase does not necessarily give a true indication of the state of an industry.

The number of mineral concessions granted during the year amounted to 769 against 624 in the preceding year; of these one was an exploring license, 654 were prospecting licenses and 114 were mining leases.

TABLE 1.—*Total Value of Minerals for which returns of production are available for the years 1923 and 1924.*

	1923 (£1 = Rs. 15).	1924 (£1 = Rs. 13·9).	Increase	Decrease.	Variation per cent.
	£	£	£	£	
Coal . . . . .	(a) 9,737,316	10,766,928	1,029,612	..	+ 10·6
Petroleum . . . . .	7,007,915	7,559,233	551,318	..	+ 7·8
Manganese-ore (b) . . . . .	2,172,544	2,719,949	547,405	..	+ 25·2
Gold . . . . .	1,702,642	1,827,433	124,791	..	+ 7·3
Lead and lead-ore . . . . .	1,121,474	1,694,679	573,205	..	+ 51·1
Silver . . . . .	677,207	810,869	133,662	..	+ 19·7
Building materials . . . . .	512,409	733,117	220,708	..	+ 43·1
Salt . . . . .	749,382	700,717	..	48,665	— 6·5
Mica (c) . . . . .	538,435	679,796	141,361	..	+ 26·3
Iron-ore . . . . .	(a) 139,593	279,610	140,017	..	+ 100·3
Tin and Tin-ore . . . . .	185,641	218,363	32,722	..	+ 17·6
Saltpetre . . . . .	(a) 152,856	182,305	29,449	..	+ 19·3
Copper (d) . . . . .	4,367	114,714	110,347	..	+ 2,526·8
Zinc-ore (c) . . . . .	11,584	83,486	71,902	..	..
Jadeite (c) . . . . .	55,803	50,849	..	4,954	— 8·9
Chromite . . . . .	51,119	12,259	..	8,860	— 17·3
Ruby, Sapphire and Spinel . . . . .	48,679	34,773	..	13,906	— 28·6
Clays . . . . .	21,356	25,178	3,822	..	+ 17·9
Tungsten-ore . . . . .	31,979	24,559	..	7,420	— 23·2
Magnesite . . . . .	15,622	21,088	5,466	..	+ 34·9
Bauxite . . . . .	3,682	13,531	9,849	..	..
Monazite . . . . .	3,697	9,301	5,604	..	..
Gypsum . . . . .	(a) 1,914	5,527	3,613	..	+ 11·8
Apatite . . . . .	5,388	4,892	..	496	— 9·2
Steatite . . . . .	(a) 5,437	4,977	..	460	— 8·5
Ochre . . . . .	(a) 4,476	4,800	324	..	+ 7·2
Zircon . . . . .	1,160	2,717	1,557	..	+ 134·2
Barytes . . . . .	2,850	2,255	..	595	— 20·9
Diamonds . . . . .	3,100	1,985	..	1,115	— 35·9
Ilmenite . . . . .	2,100	1,381	..	719	— 34·2
Asbestos . . . . .	659	1,354	695	..	+ 105·5
Alum . . . . .	4,298	1,359	..	2,939	— 68·3
Fuller's earth . . . . .	3,811	1,153	..	2,658	— 69·7
Amber . . . . .	915	1,101	186	..	+ 20·3
Kyanite . . . . .	..	212	242	..	..
Soda . . . . .	1,600	96	..	1,504	— 94·0
Bismuth-ore . . . . .	..	17	17	..	..
Serpentine . . . . .	..	5	5	..	..
Hyalite . . . . .	352	..	..	352	..
<b>Total</b> . . . . .	<b>24,986,392</b>	<b>28,626,598</b>	<b>3,734,849</b>	<b>94,613</b>	<b>+ 14·6</b>
			<b>+ 3,640,206</b>		

(a) Revised.

(b) Value f.o.b.

(c) Export values.

(d) Copper-ore in 1923 : copper-matte in 1924



## II.—MINERALS OF GROUP I.

Chromite.	Iron.	Manganese.	Ruby, Sapphire	Silver.
Coal.	Jadeite.	Mica.	and Spinel.	Tin.
Copper.	Lead.	Monazite.	Salt.	Tungsten.
Diamonds.	Magnesite.	Petroleum.	Saltpetre.	Zinc.
Gold.				

## Chromite.

In spite of an increase in production of about 2,400 tons in Baluchistan, there was a total decrease during 1924 of over 9,000 tons in the production of chromite in India, due to a decreased output of over 11,000 tons from Mysore.

TABLE 2. *Quantity and value of Chromite produced in India during 1923 and 1924.*

	1923.			1924.		
	Quantity	Value		Quantity.	Value	
		(£1 Rs. 15).			(£1 Rs. 13-9).	
	Tons.	Rs	£	Tons.	Rs.	£
<i>Baluchistan</i> —						
Quetta-Pishin	1,257	6,364	424	81	403	29
Zhob . . .	23,062	3,39,453	22,630	26,629	3,81,810	27,468
<i>Bihar and</i>						
<i>Orissa</i> —						
Singbhum . .	914	11,977	798	1,140	19,241	1,384
<i>Mysore</i> —						
Hassan . . .	25,604	3,68,202	24,551	13,791	1,09,528	7,860
Mysore . . .	3,405	40,735	2,716	3,821	76,420	5,498
<b>Total . . .</b>	<b>54,242</b>	<b>7,66,791</b>	<b>51,119</b>	<b>45,462</b>	<b>5,87,462</b>	<b>42,259</b>

## Coal.

There was an increase during the year of about 1,520,000 tons, or about 7·7 per cent., in the output of coal. This increase was largely due to Bengal, Bihar and Orissa and the Central Provinces, with a substantial increase in the case of Central India. There was a small decrease in the outturn from Hyderabad and Baluchistan. The increase in Bengal was from the Raniganj field, and in Bihar and Orissa mainly from the Jharia and the Bokaro fields, with also a substantial increase from Giridih. The increase in the Central Provinces was mainly due to the Pench Valley, where the increase was 37 per cent.,

and to a small extent to Ballarpur, whilst there was a moderate decrease in the output from Mohpani. The increase in Central India was to a small extent due to a partial recovery in the Umaria field from the decline recorded for several years past, but was, in the main, due to a large increase (64 per cent.) in the Sohagpur coalfield, the production of which surpassed that of Umaria for the first time. Production in the Sohagpur field dates only from 1921. The decline in Hyderabad is shared by both the Sasti and Singareni fields. No production was recorded from the new Loi-an field of Burma. Amongst the Tertiary coalfields, substantial increases are recorded from the Jhelum and Mianwali coalfields of the Punjab, and a large percentage increase, over 20 per cent., from the Bikanir State in Rajputana; whilst small decreases are recorded from the coalfields of Baluchistan.

The total value of the coal produced rose from Rs. 14,60,59,747 (£9,737,316) in 1923 to Rs. 14,96,60,304 (£10,766,928) in 1924, owing to the larger total production. But in the majority of fields, there was a slight decrease in the pit's mouth value per ton of coal. The decrease varied from as little as 1 pie per ton in Central India to as much as Re. 1-4-5 in the Punjab; the decrease in the coalfields of Bengal averaged Re. 1-0-10, in Bihar and Orissa Re. 0-1-10, and in the Central Provinces Re. 0-9-2. On the other hand there were trivial increases in value in Assam and Rajputana, with an increase of Re. 0-15-10 in Baluchistan and the very large increase of Rs. 8-10-6 in Burma. This last increase is presumably due to the cessation of extraction in the Loi-an field.

TABLE 3.- *Average price (per ton) of Coal extracted from the mines in each province during the years 1923 and 1924.*

	1923.			1924.		
	Rs.	A.	P.	Rs.	A.	P.
Assam . . . . .	8	11	1	8	12	11
Baluchistan . . . . .	14	14	4	15	14	2
Bengal . . . . .	9	1	9	8	0	11
Bihar and Orissa . . . . .	6	13	7	6	11	9
Burma . . . . .	21	5	6	30	9	0
Central India . . . . .	5	13	0	5	12	11
Central Provinces . . . . .	6	10	7	6	1	5
Punjab . . . . .	9	15	10	8	11	5
Rajputana . . . . .	6	13	9	7	1	4

TABLE 4. --Origin of Indian Coal raised during 1923 and 1924.

	Average of last five years.	1923.	1924.
	Tons.	Tons.	Tons.
Gondwana Coalfields . . . .	19,269,105	19,217,176	20,698,660
Tertiary Coalfields . . . . .	442,808	439,707	477,916
<b>Total</b> . . . . .	<b>19,712,213</b>	<b>19,656,883</b>	<b>21,176,606</b>

TABLE 5. Provincial production of Coal during the years 1923 and 1924.

Province	1923.	1924.	Increase.	Decrease.
	Tons.	Tons.	Tons.	Ton .
Assam . . . . .	326,149	334,842	8,693	..
Baluchistan . . . . .	42,562	40,557	..	2,005
Bengal . . . . .	4,621,578	5,031,655	410,077	..
Bihar and Orissa . . . .	13,212,250	14,107,851	895,601	..
Burma . . . . .	1,271	255	..	1,016
Central India . . . . .	175,950	235,298	59,348	..
Central Provinces . . . .	548,074	679,081	131,007	..
Hyderabad . . . . .	658,429	644,775	..	13,654
Punjab . . . . .	63,501	80,422	16,921	..
Rajputana . . . . .	7,119	21,870	14,751	..
<b>Total</b> . . . . .	<b>19,656,883</b>	<b>21,176,606</b>	<b>1,536,398</b>	<b>16,675</b>

TABLE 6.—*Output of Gondwana Coalfields for the years 1923 and 1924.*

Coalfields.	1923.		1924.	
	Tons.	Per cent. of Indian Total.	Tons.	Per cent. of Indian Total.
<i>Bengal, Bihar and Orissa</i>				
Bokaro . . . . .	1,060,366	5.39	1,313,500	6.34
Daltonganj . . . . .	11,815	0.06	4,691	0.02
Giridih . . . . .	713,598	3.58	768,690	3.63
Jainti . . . . .	82,166	0.42	78,547	0.38
Jharia . . . . .	10,346,015	52.63	10,845,642	51.22
Rajmahal Hills . . . . .	2,635	0.01	(a) 2,322	0.01
Ramgarh . . . . .	4,197	0.02	5,905	0.03
Rampur (Raigarh-Hingir) . . . . .	50,796	0.26	49,415	0.23
Raniganj . . . . .	5,557,421	28.28	6,035,347	28.50
Talcher . . . . .	4,816	0.02	5,417	0.03
<i>Burma—</i>				
Loi-an (Kalaw) . . . . .	895	0.01	..	..
<i>Central India—</i>				
Sohagpur . . . . .	80,125	0.41	131,174	0.62
Umariā . . . . .	95,825	0.49	104,121	0.49
<i>Central Provinces—</i>				
Ballarpur . . . . .	112,362	0.57	127,545	0.60
Hoshangabad . . . . .	..	..	3	..
Mohpani . . . . .	87,387	0.44	76,526	0.36
Pench Valley . . . . .	346,094	1.76	473,896	2.24
Shahpur . . . . .	2,063	0.01	1,111	..
Yeotmal . . . . .	168	..	..	..
<i>Hyderabad—</i>				
Sasti . . . . .	29,204	0.20	25,050	0.12
Singareni . . . . .	629,225	3.21	619,725	2.93
<b>Total</b> . . . . .	<b>19,217,176</b>	<b>97.77</b>	<b>20,698,660</b>	<b>97.75</b>

(a) Subject to revision.

TABLE 7.—Output of Tertiary Coalfields for the years 1923 and 1924.

	1923.		1924.	
	Tons.	Per cent. of Indian Total.	Tons.	Per cent. of Indian Total.
<i>Assam—</i>				
Khasi and Jaintia Hills . . . . .	200	1·65	280	1·58
Makum . . . . .	270,343		274,479	
Naga Hills . . . . .	55,606		60,083	
<i>Baluchistan—</i>				
Khost . . . . .	26,504	0·22	25,678	0·19
Sor Range, Kalat, Mach . . . . .	16,058		14,879	
<i>Burma—</i>				
Kamapying (Mergui) . . . . .	163	0·00	255	0·00
Kale (Upper Chindwin) . . . . .	213	0·00	..	..
<i>Punjab—</i>				
Jhelum . . . . .	43,253	0·32	52,942	0·38
Mianwali . . . . .	11,965		18,787	
Shahpur . . . . .	8,283		8,693	
<i>Rajputana—</i>				
Bikanir . . . . .	7,119	0·04	21,870	0·10
<b>Total . . . . .</b>	<b>439,707</b>	<b>2·23</b>	<b>477,946</b>	<b>2·25</b>

The total output for 1924 of 21,176,606 tons is, in fact, the greatest yet recorded for this country in any year with the exception of 1919, when the production was 22,628,037 tons.

The export statistics for coal and coke during 1924 show an increase of nearly 70,000 tons to 206,483 tons, a figure still only one-quarter of the pre-war average. In addition the imports fell from 624,918 tons to 463,716 tons, a total nearly one-third of that for 1922, and very close to the pre-war average. As before the exports were mainly to Ceylon, whereas the imports were derived chiefly from South Africa. the United Kingdom and Australia, imports from all sources showing a decline.

Taking 1 ton of coke as equivalent to 2 tons of coal, the net amount of coal available for consumption in India during 1924 was 21,465,673 tons. This is higher than the figure for any previous

year except 1919, the total for which was 22,168,495 tons. The closing stocks (2,913,028 tons) in British India at the end of 1924 were, however, only 283,836 tons greater than at the end of 1923. Nevertheless, the fundamental fact of the coal situation in India is that the total capacity of production of the Indian coal mines is now considerably in excess of total demands for internal consumption and for export. This over-production, either actual or potential, has led to severe depression in the coal industry by the beginning of 1925, with heavy falls in the price of coal and the closure of many mines. The decreased export trade referred to in the previous paragraph is partly responsible for this position, and consequently the Government of India appointed in September 1924 a committee to enquire and report on what measures could be taken to resuscitate this trade. The most important recommendations in the report of the committee<sup>1</sup> appear to be those devised to ensure that the quality of Indian coal as exported shall reach certain guaranteed standards, for no freight or other concessions of a financial nature will be of avail, if the quality of coal as exported is below anticipated standards.

TABLE 8.—*Exports of Indian Coal and Coke during the years 1923 and 1924.*

To—	1923.			1924.		
	Quantity.	Value (£1 = Rs. 15).		Quantity.	Value (£1 = Rs. 13-0).	
		Tons.	Rs.      £		Tons.	Rs.      £
Ceylon . . . .	119,616	20,19,641	134,643	170,303	27,30,318	197,073
Other countries . .	16,943	3,21,744	21,450	35,215	6,50,711	46,811
TOTAL . . . .	136,559	23,41,385	156,093	205,518	33,90,029	243,887
Coke . . . . .	16	575	38	965	29,060	2,091
Total of coal, coke, etc. .	136,575	23,41,960	156,131	206,483	34,19,088	245,978

<sup>1</sup> Report of the Indian Coal Committee, 1925.

TABLE 9.—Imports of Coal and Coke during the years 1923 and 1924.

	1923.			1924.		
	Quantity.	Value (£1 = Rs. 15).		Quantity.	Value (£1 = Rs. 13-9).	
From—	Tons.	Rs.	£	Tons.	Rs.	£
Australia and New Zealand.	59,380	21,61,940	144,129	21,803	7,40,279	53,257
Japan	4,080	1,64,274	10,952	2,384	84,410	6,073
Portuguese East Africa	115,942	31,10,309	207,354	141,537	35,74,357	257,148
Union of South Africa	272,371	70,11,068	467,404	172,473	41,79,946	300,716
United Kingdom	122,666	44,19,142	294,610	89,785	31,11,064	223,817
Other countries	31,404	8,67,468	57,831	2,935	56,571	4,070
<b>TOTAL</b>	<b>606,423</b>	<b>1,77,31,201</b>	<b>1,182,280</b>	<b>430,917</b>	<b>1,17,46,627</b>	<b>845,081</b>
Coke . . . . .	18,495	9,18,802	61,253	32,799	13,16,628	94,721
<b>Total of coal and coke .</b>	<b>624,918</b>	<b>1,86,53,003</b>	<b>1,243,533</b>	<b>463,716</b>	<b>1,30,63,255</b>	<b>939,802</b>

The average number of persons employed in the coalfields during the year showed a slight increase over the figures for 1923, whilst the average output per person showed a considerable improvement from 97·8 tons in 1923 to 103·5 tons during the year under review; the figure for 1919 was 111·05 tons. The number of deaths by accident was considerably less than in the preceding year, and was, in fact, equal to the average figure for the quinquennial period 1919-23, *viz.* 274. The corresponding death-rate was 1·34 per thousand persons employed, the figure for the preceding year 1923 being 1·81 per thousand.

TABLE 10.—Average number of persons employed daily in the Indian Coalfields during the years 1923 and 1924.

	Number of persons employed daily.		Output per person employed in tons.	Number of deaths by accident.	Death-rate per 1,000 persons employed.
	1923.	1924.			
Assam . . . . .	3,901	4,464	75·0	10	2·2
Baluchistan . . . . .	1,195	1,108	36·6	11	9·9
Bengal . . . . .	44,251	43,621	115·3	54	1·2
Bihar and Orissa . . . . .	123,554	128,679	109·6	144	1·1
Burma . . . . .	157	23	11·1	..	..
Central India . . . . .	2,762	3,157	74·5	14	4·4
Central Provinces . . . . .	9,857	8,125	83·6	8	·9
Hyderabad . . . . .	13,558	13,590	47·4	30	2·2
Punjab . . . . .	1,544	1,575	51·1	3	1·9
Rajputana . . . . .	99	120	182·3	..	..
<b>Total</b> . . . . .	<b>200,878</b>	<b>204,462</b>	<b>..</b>	<b>274</b>	<b>..</b>
<b>Average</b> . . . . .	<b>..</b>	<b>..</b>	<b>103·5</b>	<b>..</b>	<b>1·34</b>

### Copper.

The suspension of the operations of the Cape Copper Co. in 1923 recorded in the previous Review continued during 1924. In the Review for 1923, references are made to the results of the prospecting operations of the Cordoba Copper Co., prospecting also on the Singhbhum Copper Belt. In 1924 this company was reconstructed as the Indian Copper Corporation, Ltd., with a capital of £225,000. This new company has acquired not only the properties of the Cordoba Copper Co., but also those of the North Anantapur Gold Mines, Ltd., lying immediately to the north, and the property in Kharsawan prospected by the Ooreguni Gold Mining Company of India, Ltd.

All work is at present being concentrated upon the Mosaboni area, where a vertical depth of 385 feet has been reached and where 328,840 tons of ore of the average contents of 4·01 per cent. of copper had been developed by the end of April 1925. The erection of concentrating and smelting plant is shortly being started, and the production stage should be reached in about two years' time.

It will be judged from the above that there was no production of copper-ore to be reported in Singhbhum for the year 1924. In Burma, however, the production of 2,935 tons\* of copper-matte valued at Rs. 15,94,527 (£114,714 at £1=13·9) was reported by the Burma Corporation, Ltd., in the Northern Shan States. There was also a small production of 38 tons of copper-ore valued at Rs. 1,140 (£82) in the Southern Shan States.

### Diamonds.

The output of diamonds from Central India amounted to 66·6 carats, valued at Rs. 27,596 (£1,985), against 115·22 carats, valued at Rs. 46,495 (£3,100), in the preceding year.

### Gold.

The total gold production for the year 1923 was recorded in the previous Review as 422,306·56 ozs., valued at £1,702,642. Of this total quantity only the output of Anantapur and the gold recovered from cyanide slags on the Kolar gold field of Mysore was returned in terms of fine gold. With effect from 1924, however, the whole of the output of the Kolar gold mines is being recorded in terms of fine gold; consequently, in table 11. the output for 1923



has been modified by substituting for the figure of 419,667·64 ozs. of gold won in Kolar the figure of 381,058·93 ozs. of fine gold contained therein. Comparing these two years we now find that the total output of gold in 1923 was 383,697·85 ozs., valued at £1,702,642, rising in 1924 to 396,351·103 ozs., valued at £1,827,433. This improved result was due partly to an increased production from the Anantapur district resulting from the treatment of the payable ore of the Jibutil (Anantapur) Gold Mines, Ltd., in the reduction works of the Anantapur Gold Mines, Ltd., which company had ceased to mill its own ore. But the greater part of the increase was due to an increased outturn from the Kolar mines. It is of interest to record that encouraging results were being obtained from the bottom levels of several of these mines, particularly Champion Reef and Ooregum, the latter of which has now reached a depth of over 6,000 feet vertical from the surface.

TABLE 11.— *Quantity and value of Gold produced in India during the years 1923 and 1924.*

	1923.			1924.			
	Quantity.	Value (£1 = Rs. 15).		Quantity.	Value (£1 = Rs. 13·0).		Labour.
	Ozs.	Rs.	£	Ozs.	Rs.	£	
Burma— Katha .	23·46	1,672	111	23·58	1,441	104	35
Upper Chin dwin.	44·30	4,134	276	43·22	3,191	230	39
Madras— Anantapur.	(a) 1,519 00	1,01,016	6,734	(a) 3,646 00	2,38,605	17,166	253
Mysore .	(a) 381,058 93 (b) 1,001·46	2,53,69,141 60,600	1,691,276 4,046	(a) 392,578·183	2,51,51,948	1,800,708	19,836
Punjab .	48 80	2,860	191	57 87	2,978	214	99
United Pro- vinces.	1·90	125	8	2·25	150	11	10
<b>Total .</b>	<b>383,697·85</b>	<b>2,55,39,638</b>	<b>1,702,642</b>	<b>396,351·103</b>	<b>2,54,01,316</b>	<b>1,827,433</b>	<b>29,272</b>

(a) Fine gold.

(b) Fine gold obtained from cyanide slags.

## Iron.

The production of iron-ore increased by 76 per cent., viz., from 821,053 tons in 1923 to 1,445,313 tons in 1924. The production recorded for Mayurbhanj State represents the production by the

Tata Iron and Steel Co., Ltd., whilst of that recorded against Singhbhum 138,939 tons were produced by the Indian Iron & Steel Co. and the balance by the Bengal Iron Company.

TABLE 12.—*Quantity and value of Iron-ore produced in India during the years 1923 and 1924.*

	1923.			1924.		
	Quantity.	Value (£1 = Rs. 15).		Quantity.	Value (£1 = Rs. 13-9).	
	Tons.	Rs.	£	Tons.	Rs.	£
<i>Bihar and Orissa—</i>						
Mayurbhanj . . .	507,225	12,08,002	84,537	906,920	24,92,300	179,302
Sambalpur . . .	(a) 632	4,427	295	654	4,578	330
Singhbhum . . .	218,584	4,51,843	30,123	305,238	7,39,619	53,210
<i>Burma—</i>						
Mandalay . . .	325	(a) 1,316	88	328	(a) 1,312	94
Northern Shan States . .	52,911	(a) 2,11,014	14,110	58,086	(a) 2,34,744	16,888
<i>Central Provinces . . .</i>	24,032	1,08,033	7,202	68,361	3,73,702	26,845
<i>Mysore . . . . .</i>	16,669	47,667	3,178	14,958	39,324	2,829
<i>Other Provinces and States .</i>	71	(b)	..	108	1,001	72
<b>Total . . . . .</b>	<b>821,053</b>	<b>20,97,892</b>	<b>139,593</b>	<b>1,445,313</b>	<b>38,87,510</b>	<b>279,610</b>

(a) Estimated.  
(b) Not available.

The large increase in the production of iron-ore by the Tata Iron & Steel Co. in Mayurbhanj State is reflected in the figures of production at Jamshedpur, where the output increased from 392,135 tons of pig-iron in 1923 to 540,140 tons in 1924; the production of ferro-manganese rose from 3,506 tons in 1923 to 8,951 tons in 1924; the production of steel including rails rose from 151,097 tons in 1923 to 218,472 tons in 1924. The production of the Bengal Iron Co., Ltd., rose from 119,669 tons of pig-iron in 1923 to 147,733 tons in 1924; but the production of iron castings fell from 41,849 tons in 1923 to 27,045 tons in 1924. The production of the Indian Iron & Steel Co. rose from 77,980 tons of pig-iron in 1923 to 168,249 tons in 1924. No ferro-manganese was produced by either the Bengal Iron Company or the Indian Iron and Steel Company. The production of pig-iron at the Mysore Iron Works at Bhadravati rose from 9,732 tons in 1923, the initial year of production, to 16,425

tons in 1924. The total production of pig-iron in India rose, therefore, from 599,516 tons in 1923 to 872,547 tons in 1924. A portion of this output was, of course, utilised in the production of steel at Jamshedpur, but a large portion was exported; an export market for Indian pig-iron is, indeed, necessary for the continued success of the industry, in view of the fact that the total blast-furnace capacity of the country is much in excess of the steel-melting capacity and the internal requirements of India for iron castings. It is of interest, therefore, to record the data relating to pig-iron exports from India during the years 1923-24 and 1924-25. It will be seen from table 13 that the exports in 1924-25 were 86 per cent. above those of the previous year, but that the export value fell slightly from Rs. 69·8 (£4·65) per ton to Rs. 63·5 (£4·57) per ton.

TABLE 13.—*Exports of Pig-iron from India during 1923-24 and 1924-25.*

To—	1923-24.			1924-25.		
	Quantity.	Value (£1 = Rs. 15).		Quantity.	Value (£1 = Rs. 13-9).	
		Tons.	Rs.		£	Tons.
United Kingdom .	3,206	1,89,912	9,327	19,024	13,20,823	95,023
Germany . . . .	..	..	..	1,920	67,751	4,874
Italy . . . . .	1,091	79,535	5,302	4,552	3,13,708	22,569
China including Hong Kong.	1,153	86,123	5,712	2,905	1,76,849	12,723
Japan . . . . .	144,016	1,01,87,41~	679,163	171,665	1,15,01,074	827,415
United States of America.	24,199	15,75,300	105,020	133,761	77,71,463	559,098
Australia . . . .	2,750	1,79,553	11,970	201	13,052	910
New Zealand . .	3,950	3,01,979	20,265	3,987	2,69,269	19,372
Other countries .	2,839	2,31,612	15,411	3,611	2,47,105	17,820
Total .	183,195	1,27,83,462	852,230	341,326	2,16,81,691	1,559,834

In spite of this increased production of pig-iron and steel, the years 1923 and 1924 were not prosperous ones for the Indian iron and steel industry owing to a world-wide slump in the iron and steel trade. For this reason the conditions of the industry were investigated by the Indian Tariff Board and a measure of protec-

tion introduced for steel in 1924. As already recorded the pig-iron section of the industry found an outlet for increased production in increased exports. The prices at which it has proved possible to land cargoes of Indian pig-iron at United States ports have led to complaints from American producers and anti-dumping notices are said to have been issued against certain cargoes of Indian pig.<sup>1</sup>

In the Central Provinces the number of indigenous furnaces in operation rose from 119 in 1923 to 229 in 1924.

The output of iron-ore in Burma is by the Burma Corporation, Ltd., for use as a flux for lead smelting.

### Jadeite.

There was a further fall in the output of jadeite in Burma from 3,626·6 cwts., valued at Rs. 8,20,120 (£54,675), in 1923 to 2,630·42 cwts., valued at Rs. 8,60,493 (£61,906), in 1924. As in the previous year, the decrease in quantity extracted has not been accompanied by a corresponding fall in total value due, no doubt, to the higher quality of jadeite met with. The output figures are, however, always incomplete, and usually a better view of the extent of the jadeite industry is obtainable from the export figures, which decreased from 3,088 cwts., valued at Rs. 8,37,052 (£55,803), in 1923-24 to 2,766 cwts., valued at Rs. 7,06,800 (£50,849), in 1924-25.

### Lead.

There was a further increase of about 42,000 tons in the production of lead-ore at the Bawdwin mines, and the total amount of metal extracted increased from 46,060 tons, valued at Rs. 1,68,18,111 (£1,121,207), in 1923 to 50,559 tons of lead and 1,200 tons of antimonial lead, valued at Rs. 2,35,07,040 (£1,691,154), in 1924. The quantity of silver extracted from Bawdwin ores rose from 4,843,939 ozs., valued at Rs. 1,01,16,985 (£674,466), to 5,287,711 ozs., valued at Rs. 1,12,26,868 (£807,688). The value of the lead extracted increased from Rs. 365 (£24·4) per ton in 1923 to Rs. 459 (£33·0) per ton in the year under review, and that of silver increased from Rs. 2-1-5 (33·4d.) to Rs. 2-1-11½ (36·6d.). The capacity of the refinery has been increased so that it is now capable of producing over 5,000 tons of refined lead and 500,000 ozs. of silver monthly.

<sup>1</sup> *Iron and Coal Trades Review*, 8th May 1925, p. 757.

TABLE 14.—*Production of Lead and Silver-ore during 1923 and 1924.*

		1923.				1924.			
QUANTITY.		VALUE (£1 = Rs. 15).		VALUE (£1 = Rs. 13-9).		QUANTITY.		VALUE (£1 = Rs. 13-9).	
Lead-ore.		Lead-ore and Lead.		Silver.		Lead-ore.		Lead-ore and Lead.	
		Rs.	£	Rs.	£	Tons.	Rs.	£	Rs.
		(a)		(b)			(c)		(d)
Burma—	Northern Shan States	245,392	1,68,18,111	1,121,207	1,01,16,955	237,777	2,35,07,040	1,691,154	1,12,26,868
					674,466				807,688
Southern Shan States		33	4,000	267	..	22,509	49,000	3,525	..
<b>Total</b>		<b>245,925</b>	<b>1,68,22,111</b>	<b>1,121,474</b>	<b>1,01,16,955</b>	<b>310,286</b>	<b>2,35,56,040</b>	<b>1,694,679</b>	<b>1,12,26,868</b>
					674,466				807,688

(a) Value of 48,000 tons of lead extracted.  
(b) Value of 1,12,26,868 Rs. of silver.

(a) Value of 46,060 tons of lead extracted.  
 (b) Value of 4,843,939 ozs. of silver extracted.  
 (c) Value of 50,559 tons of lead (Rs. 2,32,00,868) and 1,200 tons of antimonial lead (Rs. 3,06,172) extracted.  
 (d) Value of 5,287,711 ozs. of silver extracted.

### Magnesite.

The prosperity of the magnesite industry since its revival in 1921 has continued ever since, and there was, in fact, a substantial increase during the year under review from a production of 19,436 tons, valued at Rs. 2,34,332 (£15,622), in 1923 to 24,461 tons, valued at Rs. 2,93,124 (£21,088), in 1924. Both the quantity and total value for 1924 are the highest yet recorded.

TABLE 15.—*Quantity and value of Magnesite produced in India during 1923 and 1924.*

	1923.			1924.		
	Quantity.	Value (£1 = Rs. 15).		Quantity.	Value (£1 = Rs. 13-9).	
		Tons.	Rs.		£	Tons.
<i>Madras—</i>						
<i>Salem</i> . . . . .	19,336	2,32,032	15,460	24,427	2,03,124	21,088
<i>Mysore</i> . . . . .	100	2,300	153	34	(a)	..
<b>Total</b> . . . . .	<b>19,436</b>	<b>2,34,332</b>	<b>15,622</b>	<b>24,461</b>	<b>2,93,124</b>	<b>21,088</b>

(a) Not available.

### Manganese.

The output of manganese-ore in India rose, again, from 695,055 tons, valued at £2,172,544 f.o.b. Indian ports, during 1923, to 303,006 tons, valued at £2,719,949 f.o.b. Indian ports, during 1924. The figures of quantity have been exceeded only in two previous years, viz., 1907 and 1913, when the productions were respectively 902,291 tons and 815,047 tons, whilst the figures of value have been exceeded only in 1920, when the value was £3,523,625. The localities chiefly responsible for the increase in production were Keonjhar State in Bihar and Orissa, the Panch Mahals in Bombay, the Balaghat and Nagpur districts in the Central Provinces, Sandur State and Vizagapatam in Madras, and the Shimoga district in Mysore. In addition the Jhabua State in Central India resumed production after a break of several years and a small initial production was recorded from the Kurnool district in Madras. On the other hand, decreases in production were recorded from Gangpur State in Bihar and Orissa, Chhota Udaipur State in Bombay, the Bhandara district in the Central

Provinces and the Mysore district in Mysore. This increased production may be attributed to the continuance of a satisfactory price for manganese which rose from an average figure of 21·2*d.* per unit in 1923 to 22·9*d.* per unit in 1924, for first-grade manganese-ore c.i.f. United Kingdom ports. Producers were, in fact, straining every nerve to comply with demands.

The exports of manganese-ore during the year showed, however, a fall of about 100,000 tons, as recorded in table 17. This fall does not, however, indicate any decrease in the activity of the industry. The high export figures for 1922 and 1923 were much in excess of the quantities produced during those years and were rendered possible only by an encroachment upon stocks accumulated during previous years. There is a steady consumption of manganese-ore at the works of the three Indian iron and steel companies, not only for use in the steel furnaces of the Tata Iron and Steel Co. and the manufacture of ferro-manganese, but also for addition to the blast-furnace charge in the manufacture of pig-iron. The receipts of manganese-ore at the iron and steel works during 1924 were 27,333 tons, the consumption in the industry was 35,238 tons, and the stocks in hand at the end of the year were 21,106 tons. The difference of a little over 50,000 tons between the quantity of manganese-ore produced in India during 1924 and the quantity exported is thus partly accounted for by internal consumption. Table 18 shows the distribution of the manganese-ore exported from British Indian ports (excluding the Portuguese port of Mormugao) during 1923 and 1924, from which it will be seen that there was a substantial increase in the exports of manganese-ore to Belgium and the United States, a heavy decrease in the quantity exported in the United Kingdom, and a moderate decrease in the amount exported to France.

The technical press has contained during the past few months many references to the negotiations between an American group of financiers and the Soviet Government for the exploitation of the manganese-ores of the Caucasus on up-to-date lines. According to recent information, the agreement has now been definitely signed. It is difficult to estimate exactly what effect will be produced upon the market for manganese-ore when the American group have been able to introduce the proposed improvements; and it is perhaps dangerous to make any prediction. It must be pointed out, however, that the total consumption of manganese ore in the world is still below the figure to which it had risen just before the out-

break of the late war, and it may be suggested with caution that at least a portion of the proposed increase in output from the Caucasus may be required in connection with any resumption of prosperity in the iron and steel industry of the world, and that the whole of the balance will not be at the expense of Indian producers. A fall in price seems, however, inevitable.

TABLE 16.--*Quantity and value of Manganese-ore produced in India during 1923 and 1924.*

	1923.		1924.	
	Quantity.	Value f.o.b. at Indian ports.	Quantity.	Value f.o.b. at Indian ports.
	Tons.	£	Tons.	£
<i>Bihar and Orissa—</i>				
Gangpur . . . . .	20,439	61,042	16,481	57,134
Konjhar . . . . .	1,968	6,166	20,803	54,434
Singbhum . . . . .	46	282	(a) 797	2,764
<i>Bombay—</i>				
Chhota Udaipur . . . . .	12,553	38,783	10,142	31,631
Panch Mahals . . . . .	35,354	110,776	46,401	160,857
<i>Central India . . . . .</i>	..	..	2,263	6,299
<i>Central Provinces—</i>				
Balaghat . . . . .	224,716	713,535	279,151	988,302
Bhandara . . . . .	79,949	261,498	74,869	273,896
Chhindwara . . . . .	30,066	99,168	32,715	119,682
Jubbulpore . . . . .	55	182	1,850	6,768
Nagpur . . . . .	196,493	650,061	201,521	748,206
<i>Madras—</i>				
Bellary . . . . .	2,429	4,909	5,424	11,481
Kurnool . . . . .	..	..	390	868
Sandur State . . . . .	37,318	75,413	43,809	92,739
Vizagapatam . . . . .	22,524	49,664	31,811	72,635
<i>Mysore—</i>				
Chitaldrug . . . . .	1,225	2,573	1,556	3,423
Mysore . . . . .	1,200	2,520	..	..
Shimoga . . . . .	28,377	59,592	36,296	79,653
Tumkur . . . . .	313	657	2,817	6,197
<b>Total . . . . .</b>	<b>695,055</b>	<b>2,172,544</b>	<b>803,006</b>	<b>2,719,949</b>

(a) Subject to revision.



TABLE 17.—*Exports of Manganese-ore during 1923 and 1924, according to Ports of Shipment.*

Port.	1923.	1924.
	Tons.	Tons.
Bombay . . . . .	386,255	279,024
Calcutta . . . . .	375,340	342,067
Vizagapatam . . . . .	14,275	20,600
Mormugao (Portuguese India) . . . . .	74,454	108,758
<b>Total</b>	<b>850,324</b>	<b>750,449</b>

TABLE 18.—*Exports of Manganese-ore from British Indian Ports during 1923 and 1924.*

To—	1923.			1924.		
	Quantity.	Value (£1 = Rs. 15).		Quantity.	Value (£1 = Rs. 13·9).	
	Tons.	Rs.	£	Tons.	Rs.	£
United Kingdom . . . . .	330,948	67,49,031	449,935	200,796	42,95,071	308,998
Germany . . . . .	7,250	1,48,125	9,875	7,300	1,07,186	12,028
Netherlands . . . . .	17,200	3,08,350	20,557	..	..	..
Belgium . . . . .	168,013	38,67,943	257,863	184,547	50,57,937	363,880
France . . . . .	173,057	35,91,847	239,457	139,550	33,41,225	240,376
Italy . . . . .	10,862	5,88,307	39,226	8,242	3,32,688	23,934
Japan . . . . .	5,657	1,39,038	9,269	250	10,500	755
United States of America . . . . .	63,883	21,38,001	142,533	98,094	31,78,005	228,040
Other countries . . . . .	..	..	..	2,912	1,04,662	7,530
<b>Total</b>	<b>775,870</b>	<b>1,75,30,732</b>	<b>1,168,715</b>	<b>641,691</b>	<b>1,64,87,364</b>	<b>1,186,141</b>

### Mica.

There was an increase of some 7,000 cwts. in the declared output of mica in 1924 above that of the previous year. As has been frequently pointed out, the output figures are incomplete, and a better idea of the size of the industry is contained from the export figures.

The export figures in 1924 exceeded, in fact, the reported production by over 71 per cent., amounting to 70,095 cwts., valued at Rs. 94,49,168 (£679,796), which, in quantity, is less, and, in value, more than the figures for 1923, *viz.*, 83,296 cwts., valued at Rs. 80,76,552 (£538,435). The average price of the mica exported rose, therefore, from Rs. 97 (£6·5) per cwt. to Rs. 135 (£9·7) per cwt.

TABLE 19.—*Quantity and value of Mica produced in India during 1923 and 1924.*

	1923.			1924.		
	Quantity.	Value (£1 = Rs. 15).		Quantity.	Value (£1 = Rs. 13 9).	
		Cwts.	Rs.		£	Cwts.
<i>Bihar and Orissa—</i>						
Bhagalpur . . . . .	..	..	..	15	530	38
Gayz . . . . .	2,040	1,10,785	7,386	5,274	2,56,496	18,453
Hazaribagh . . . . .	20,849	10,05,166	71,011	23,205	11,74,060	84,461
Moughyr . . . . .	15	525	35	242	18,514	1,332
<i>Delhi . . . . .</i>	..	..	..	20	28	2
<i>Madras—</i>						
Nellore . . . . .	8,671	3,14,703	20,980	10,908	4,07,307	35,778
Nilgiris . . . . .	143	23,012	1,594	365	50,041	3,600
<i>Mysore—</i>						
Hasan . . . . .	16	1,209	81	..	..	..
Mysore . . . . .	(a) 32 7	548	37	15·2	(b)	(b)
<i>Rajputana—</i>						
Ajmer-Merwara . . . . .	539 3	52,880	3,525	509	46,749	3,363
Shahpura . . . . .	640·2	18,217	1,214	354 7	15,192	1,093
<b>Total . . . . .</b>	<b>33,855·2</b>	<b>15,87,945</b>	<b>105,863</b>	<b>40,907·9</b>	<b>20,58,917</b>	<b>118,123</b>

(a) Excludes 370·7 cwts. of raw mica.

(b) Not available.

### Monazite.

There was a further recovery in the output of monazite in Travancore from 246·3 tons, valued at £3,697, in 1923, to 622·3 tons, valued at £9,301·5, in the year under review.

### Petroleum.

The peak of production of petroleum in India (including Burma) was reached in 1919 and 1921, since when there has been a small but definite fall in production to a figure of nearly 294½ million gallons in 1923. As the total production for 1924 was a little over 294½ million gallons, the decline appears for the moment to have been arrested. Such coincidence of output for two successive years must, however, be regarded as fortuitous, as the total is made up of the production of a large number of fields, some of which record decreases and some increases. During 1924, the Yenangyaung field showed an increase of nearly 6½ million gallons in contrast to the decrease of 4½ million gallons recorded in the previous year. The production shown includes an output of nearly 2½ million gallons from hand-dug wells. There was also a substantial increase of over 2 million gallons in the output from the Digboi field. Apart from a trivial increase in the Upper Chindwin, all the other fields showed a decline, which was most serious in the case of Singu, amounting roughly to 7½ million gallons. Less serious decreases were shown by the Badarpur field in Assam and the Minbu, Thayetmyo and Yenangyat fields in Burma, whilst the Attock field, in contrast to the heavy increase of nearly 4½ million gallons in 1923, showed a small decline.

In the Yenangyaung field, the exploitation of the shallow oil-sands, referred to in the previous Review, has continued, and the attention to this hitherto neglected source of supply is delaying the inevitable decline in production from this field. As the recorded figures of production are the nett figures after deduction of quantities of oil used as fuel on the field, the electrification of the field, which has now reached the present limit of practicability, is another factor tending to delay this decline.

The set-back in production in the Attock district is due to the decline in the output from the older wells being greater than the supplies added by new wells. To remedy this, drilling is being conducted with increased activity on the Khaur field, to which the plant in operation at Dhulian has also been transferred, the test boring at Dhulian having thus been suspended at 3,281 feet from the surface.

The rupee value of the output in 1924 was almost identical with that of 1923, but, owing to the higher sterling value of the rupee in the later year, the sterling value of the production showed an increase of over £550,000.

**TABLE 20.**—*Quantity and value of Petroleum produced in India during 1923 and 1924.*

	1923.			1924.		
	Quantity.	Value (£ 1 = Rs. 15).		Quantity.	Value (£ 1 = Rs. 13·9).	
<i>Assam—</i>	Gals.	Rs.	£	Gals.	Rs.	£
Badarpur . .	3,555,377	4,01,912	26,794	3,277,829	7,41,074	53,315
Digboi . .	7,448,710	12,71,935	84,796	9,697,420	16,56,642	119,183
<i>Burma—</i>						
Akyab . .	8,628	2,573	172	7,014	2,024	145
Kyaukpadaung . .	16,721	16,714	1,114	14,708	14,911	1,073
Minbu . .	3,915,110	12,23,481	81,565	3,829,041	9,57,261	68,868
Sungu . .	87,476,174	3,28,03,678	2,186,912	79,938,430	2,99,76,911	2,156,612
Thayetmyo . .	1,818,584	4,54,646	30,310	1,717,653	5,36,767	38,616
Upper Chindwin . .	1,311,644	98,374	6,558	1,471,898	1,10,617	7,958
Yenangyat . .	1,700,035	4,42,717	29,514	1,594,517	3,98,629	28,678
Yenangyaung . .	175,158,721	6,54,51,455	4,363,430	181,636,739	6,78,32,646	4,880,046
<i>Punjab—</i>						
Attock . .	11,804,560	29,51,140	196,743	11,383,240	28,45,810	204,735
Mianwali . .	450	112	7	200	50	4
<b>Total</b>	<b>294,215,053</b>	<b>10,51,18,737</b>	<b>7,097,915</b>	<b>294,571,692</b>	<b>10,50,73,342</b>	<b>7,559,233</b>

There was again an increase in the imports of kerosine oil, the increase being nearly 8 million gallons. This increase is the balance of some 17 million gallons total increase in the imports from the United States of America and Georgia and of decreases or complete cessation of imports from Borneo, Russia, the Straits Settlements and Sumatra.

In view of the rapidly increasing consumption of fuel oil, to give only the imports of kerosine oil into India is to convey an inadequate idea of the consumption in India of products derived from petroleum, and for this reason an extra table is now added showing the imports of fuel oils into India during the years 1923 and 1924. It will be seen that they show an increase from 72 million gallons in 1923 to 89 million gallons in 1924 of a total value of Rs. 1,82,89,909 (£1,315,821).

During 1924, the exports of paraffin wax increased by nearly 5,000 tons, in contrast to the decrease of over 3,000 tons recorded in the previous year.

TABLE 21.—Imports of Kerosine Oil during 1923 and 1924.

From—	1923.			1924.		
	Quantity.	Value (£ 1 = Rs. 15).		Quantity.	Value (£1 = Rs. 13·9).	
		Gals.	Rs.		Gals.	Rs.
Borneo . .	10,045,993	52,69,607	351,307	7,355,960	36,48,433	262,477
Georgia . .	2,098,204	13,11,377	87,425	9,242,682	56,46,665	406,235
Russia . .	2,003,520	10,33,068	68,871	..	..	..
Straits Settlements (including Labuan).	1,807,050	10,52,739	70,183	1,310	735	53
Sumatra . .	1,678,770	8,65,615	57,708	..	..	..
United States of America.	45,760,974	3,17,31,745	2,115,450	55,206,916	3,75,05,896	2,698,266
Other countries .	669,108	4,19,597	27,973	677	1,286	92
<b>Total</b> .	<b>64,063,837</b>	<b>4,16,83,748</b>	<b>2,778,917</b>	<b>71,807,575</b>	<b>4,68,03,015</b>	<b>3,367,123</b>

TABLE 22.—Imports of Fuel Oils into India during the years 1923 and 1924.

From—	1923.			1924.		
	Quantity.	Value (£ 1 = Rs. 15).		Quantity.	Value (£1 = Rs. 13·9).	
		Gals.	Rs.		Gals.	Rs.
Persia . .	61,994,844	1,17,43,470	782,898	60,000,473	1,34,07,620	964,578
Straits Settlements (including Labuan).	2,470,674	8,40,541	56,036	2,136,538	7,35,360	52,904
Borneo . .	7,453,185	25,75,449	171,697	16,986,682	41,28,141	296,988
Other countries .	116,331	18,245	1,216	129,250	18,779	1,351
<b>Total</b> .	<b>72,035,034</b>	<b>1,51,77,705</b>	<b>1,011,847</b>	<b>80,152,952</b>	<b>1,82,89,909</b>	<b>1,315,821</b>

TABLE 23.—*Exports of Paraffin Wax from India during 1923 and 1924.*

To—	1923			1924.		
	Quantity.	Value (£1 = Rs. 15).		Quantity.	Value (£1 = Rs. 13.9).	
		Tons.	Rs.	Tons.	Rs.	£
Australia and New Zealand.	1,287	5,85,671	39,045	1,489	6,77,718	48,757
Belgium . . .	1,405	6,39,275	42,618	3,065	13,94,547	100,327
China . . .	6,254	28,29,744	188,650	2,141	9,34,908	67,259
Egypt . . .	..	..	..	49	22,225	1,599
Italy . . .	120	54,600	3,610	135	61,075	4,394
Japan . . .	6,627	30,35,200	202,317	4,387	19,95,530	143,563
United Kingdom .	2,779	12,68,960	84,597	8,191	38,21,965	274,962
Union of South Africa .	1,745	7,93,100	52,873	2,441	11,10,155	79,867
United States of America.	1,104	5,02,447	33,497	625	2,84,318	20,455
Other countries .	3,243	11,35,263	95,684	6,881	31,74,377	228,372
<b>Total .</b>	<b>24,564</b>	<b>1,11,41,260</b>	<b>742,951</b>	<b>29,407</b>	<b>1,34,76,818</b>	<b>969,556</b>

### Ruby, Sapphire and Spinel.

In continuation of the decrease in the output from the Mogok ruby mines recorded in the previous Review, there was a still more serious fall in 1924 to the very small figure of 101,097 carats, or less than half the average annual quantity produced during the two preceding quinquennial periods. This decline was shared by all the three stones, rubies, sapphires and spinels. The fall in the total value was not, however, proportionate to the fall in weight, as the average value per carat of the three stones taken together rose from Rs. 3.9 (£0.26) in 1923 to Rs. 4.8 (£0.34) in 1925.

TABLE 24.—Quantity and value of Ruby, Sapphire and Spinel produced in India during 1923 and 1924.

	1923.			1924.		
	Quantity.	Value (£1 = Rs. 15).		Quantity.	Value (£1 = Rs. 13'9).	
		Carats.	Rs.      £		Carats.	Rs.      £
Burma . . . . .	92,592 (Rubies). 65,692 (Sapphires). 28,726 (Spinel).	6,03,064	41,204	53,511 (Rubies). 37,912 (Sapphires). 9,644 (Spinel).	4,22,240	30,377
Total . . . . .	187,010	7,30,188	48,679	101,087	4,83,310	34,773

## Salt.

The continual increase in the production of salt since 1921 was checked in the year under review, when there was a fall to the extent of over 157,000 tons, all the major producing areas contributing to this fall with the exception of Aden, which showed an increase of about 10,000 tons.

TABLE 25.—Quantity and value of Salt produced in India during the years 1923 and 1924.

	1923.			1924.		
	Quantity	Value (£1 = Rs. 15)		Quantity.	Value (£1 = Rs. 13'9).	
		Tons.	Rs.      £		Tons.	Rs.      £
Aden . . . . .	169,282	10,01,852	66,990	179,182	8,61,291	61,963
Bombay and Sind . . . . .	613,150	31,11,813	229,456	538,777	29,35,188	211,165
Burma . . . . .	34,622	6,69,000	46,600	20,557	2,63,586	18,963
Central India . . . . .	9'3	504	34	..	..	..
Gwalior . . . . .	22	1,061	71	151	8,230	592
Kashmir . . . . .	0'6	100	6	(a)	162	11
Madras . . . . .	485,509	30,70,226	204,682	407,544	27,32,822	196,606
Northern India . . . . .	479,295	30,13,046	200,870	477,264	29,38,703	211,417
Rajputana . . . . . (Jaisalmer State).	206	10,103	673	..	..	..
Total . . . . .	1,781,155'9	1,12,40,735	749,382	1,823,475	97,19,972	700,717

(a) Not available.

TABLE 26.—*Quantity and value of Rock-salt produced in India during 1923 and 1924.*

	1923.			1924.		
	Quantity.	Value (£1 = Rs. 15).		Quantity.	Value (£1 = Rs. 13·9).	
		Tons.	Rs.		£	Tons.
Salt Range . . .	183,533	9,36,785	62,452	160,049	8,16,248	58,723
Kohat . . .	18,904	50,411	3,763	24,485	78,801	5,669
Mandi . . .	4,875	87,095	5,806	4,703	1,33,913	9,634
Total	207,312	10,80,321	72,021	189,237	10,28,962	74,026

The total decrease includes a decrease in the output of rock-salt amounting to some 18,000 tons. There was an increase in the imports of salt amounting to some 87,000 tons, this increase being due largely to increased imports from Egypt and Aden set off only partly by decreases in the imports from the United Kingdom, Germany, Spain, and Italian East Africa.

TABLE 27.—*Imports of Salt into India during the years 1923 and 1924.*

From—	1923.			1924.		
	Quantity.	Value (£1 = Rs. 15).		Quantity.	Value (£1 = Rs. 13·0).	
		Tons.	Rs.		£	Tons.
United Kingdom .	110,968	29,79,674	198,645	104,825	27,40,127	197,131
Germany . . .	35,720	9,86,386	65,759	26,417	7,06,848	50,862
Spain . . .	45,579	13,40,659	89,377	12,247	2,55,264	18,364
Aden and Depend- encies.	165,499	38,82,266	258,818	216,255	48,70,983	350,431
Egypt . . .	76,053	18,47,153	123,144	154,123	35,62,448	256,291
Italian East Africa .	74,826	19,45,787	129,719	63,557	13,62,107	97,993
Other countries . .	15	2,325	156	18,242	3,98,993	28,705
Total .	508,650	1,29,84,250	865,617	586,686	1,38,96,770	999,767



### Saltpetre.

There was in 1924 again a decrease in the total output of salt-petre in India, but only a trivial one; for a considerable decrease in the output from the United Provinces was balanced by a roughly equivalent increase in the outputs from the Punjab and Bihar. The total Indian production\* amounted to 8,543 tons, valued at Rs. 25,34,037 (£182,305), in 1924, against 8,716 tons, valued at Rs. 22,92,834 (£152,856), in 1923. On the other hand, there was a slight increase in the exports of saltpetre from 8,068 tons in 1923 to 8,385 tons in the year under review, the decreases in the quantities exported to Mauritius, the Straits Settlements, and the United Kingdom, being more than set off by increases in the exports to Ceylon and Hongkong.

TABLE 28.—*Quantity and value of Saltpetre produced in India during the years 1923 and 1924.*

	1923.			1924.		
	Quantity.	Value (£1 = Rs. 15).		Quantity.	Value (£1 = Rs. 13·9).	
	Tons.	Rs.	£	Tons.	Rs.	£
Bengal . .	22·6	(a)8,293	553	44·1	10,791	776
Bihar (refined) .	1,622·9	3,86,243	25,749	1,819·8	5,10,469	36,724
Bihar ( <i>kuthia</i> ) .	1,359·8	1,98,978	13,265	1,384·0	2,98,944	21,507
Central India .	18·0	4,030	269	14·2	2,951	212
Madras ( <i>b</i> ) . .	138·1	(a)38,186	2,546	112·3	(a)32,554	2,342
Punjab . .	3,056·5	9,76,860	65,124	3,315·5	11,45,811	82,433
Rajputana . .	..	.	..	24·0	7,020	505
United Provinces.	2,498·2	6,80,244	45,350	1,829·1	5,25,497	37,806
<b>Total .</b>	<b>8,716·1</b>	<b>22,92,834</b>	<b>152,856</b>	<b>8,543·0</b>	<b>25,34,037</b>	<b>182,305</b>

(a) Estimated.

(b) Production for the official year.

TABLE 29.—*Distribution of Saltpetre exported during the years 1923 and 1924.*

	1923.			1924.		
	Quantity.	Value (£1—Rs. 15).		Quantity.	Value (£1—Rs. 13-9).	
To—	Cwts.	Rs.	£	Cwts.	Rs.	£
Ceylon . .	55,017	7,00,637	46,709	68,518	8,62,089	62,621
Hongkong .	25,949	5,68,629	37,909	35,597	7,97,507	57,375
Mauritius and Dependencies.	47,109	8,35,998	55,733	36,194	6,49,088	46,697
Straits Settlements (including Labuan).	5,216	1,17,337	7,823	4,795	1,08,192	7,783
United Kingdom.	17,313	2,92,309	19,187	15,988	2,30,014	16,548
Other countries	10,753	1,91,672	12,778	6,608	1,52,323	10,958
<b>Total .</b>	<b>161,357</b>	<b>27,06,582</b>	<b>180,439</b>	<b>167,700</b>	<b>27,99,213</b>	<b>201,382</b>

## Silver.

There was a further increase in the output of silver from Bawdwin amounting to 444,000 ounces. Small increases were also shown in the production from the Kolar and Anantapur Gold Mines. The total Indian production was 5,309,203 ounces valued at Rs. 1,12,71,086 (£810,869).

TABLE 30.—*Quantity and value of Silver produced in India during 1923 and 1924.*

	1923.			1924.		
	Quantity.	Value (Rupee—1s. 4d.).		Quantity.	Value (£1—Rs. 13-9).	
	Oz.	Rs.	£	Oz.	Rs.	£
Burma—						
Northern Shan States.	4,843,939	1,01,16,985	674,466	5,287,711	1,12,26,868	807,688
Madras—						
Anantapur .	103	202	13	249	493	35
Mysore—						
Kolar . .	19,024	40,915	2,728	21,243-4	43,725	3,146
<b>Total .</b>	<b>4,863,066</b>	<b>1,01,58,102</b>	<b>677,207</b>	<b>5,309,203-4</b>	<b>1,12,71,086</b>	<b>810,869</b>

## Tin.

In contrast to the previous year, there was a small decrease in the production of tin-ore amounting to 43½ tons. The total production of 1,963 tons was derived from Burma, Tavoy contributing 73.0 per cent. and Mergui 26.5 per cent., the small balance coming from Amherst and Thaton. There was no recorded output of block tin. The imports of unwrought tin were practically the same at 48,474 cwt. in 1921 as in the previous year; 93.4 per cent. of these imports came from the Straits Settlements.

TABLE 31.—*Quantity and value of Tin-ore for the years 1923 and 1924.*

	1923.			1924.		
	Quantity.		Value (£1—Rs. 15).	Quantity.		Value (£1—Rs. 13 9).
	Tons.	Rs.	£	Tons.	Rs.	£
Burma—						
Amherst .	3.2	2,002	133	3.7	5,606	403
Mergui .	527.8	8,07,923	53,862	520.3	9,58,534	68,959
Tavoy .	1,473.0	19,70,786	131,386	1,433.0	20,61,107	148,281
Thaton .	3.0	3,900	260	6.5	10,000	720
<b>Total .</b>	<b>2,007 0</b>	<b>27,84,611</b>	<b>185,611</b>	<b>1,963.5</b> (a)	<b>30,35,217</b> (a)	<b>218,363</b> (a)

(a) Subject to revision.

TABLE 32.—*Imports of unwrought Tin (block, ingots, slabs) into India during 1923 and 1924.*

	1923.			1924.		
	Quantity.		Value (£1—Rs. 15).	Quantity.		Value (£1—Rs. 13.9).
	Cwts.	Rs.	£	Cwts.	Rs.	£
From—						
United Kingdom.	3,755	5,09,977	33,998	2,807	4,92,489	35,431
Straits Settlements (including Labuan).	43,835	59,74,758	398,317	45,301	72,80,488	524,424
Other countries	752	1,06,887	7,126	366	52,340	3,765
<b>Total .</b>	<b>48,342</b>	<b>65,91,622</b>	<b>439,441</b>	<b>48,474</b>	<b>78,34,317</b>	<b>563,620</b>

**Tungsten.**

The production of wolfram decreased considerably from 872 tons, valued at Rs. 4,79,693 (£31,979), in 1923 to 739 tons, valued at Rs. 3,41,381 (£24,559). Practically the whole of the output was derived from the Tavoy district.

**TABLE 33.—Quantity and value of Tungsten-ore produced in India during 1923 and 1924.**

	1923.			1924.		
	Quantity.	Value (£1—Rs. 15).		Quantity.	Value (£1—Rs. 13 9).	
	Tons.	Rs.	£	Tons.	Rs.	£
Burma—						
Mergui	0.2	52	3	0.3	91	6
Tavoy	871.8	4,79,641	31,976	738.7	3,41,290	24,553
<b>Total</b>	<b>872.0</b>	<b>4,79,693</b>	<b>31,979</b>	<b>739.0</b>	<b>3,41,381</b>	<b>24,559</b>

**Zinc.**

18,650 tons of zinc concentrates were produced by the Burma Corporation, Ltd., in the Northern Shan States during the year under review. The exports of these concentrates during the year amounted to 15,192 tons, valued at Rs. 11,60,449 (£83,486). During the year the mill flow sheet of this Company was modified to permit of the production of a marketable zinc concentrate, and an increased output is to be anticipated during 1925.

**III.—MINERALS OF GROUP II.**

There was again a large decrease in the production of alum in the Mianwali district of the Punjab, for the output in 1924 amounted to only 926.5 cwt., valued at Rs. 18,900 (£1,359), as against 3,456 cwt., valued at Rs. 64,472 (£1,298) in 1923.

**Alum.**

The production of amber in Burma rose from 47.9 cwt., valued at Rs. 13,720 (£915), in 1923, to 89.3 cwt., valued at Rs. 15,301 (£1,101), in the year under review.

**Amber.**

The output of apatite and phosphate-rock in Singhbhum rose from 4,762 tons, valued at Rs. 80,820 (£5,388), in 1923, to 6,426 tons, valued at Rs. 68,004 (£4,892), in 1924.

In 1923, the production of asbestos in India amounted to 247 tons, valued at Rs. 9,880 (£659), obtained in the Hassan district of Mysore State. The production for 1924 was only 125.3 tons, valued at Rs. 18,826 (£1,354), and derived from Seraikela State in Singhbhum, Bhandara district in the Central Provinces, and the Cuddapah district of Madras as follows :—

	Quantity.	Value.
	Tons.	Rs.
<i>Bihar and Orissa—</i>		
Seraikela . . . . .	92	11,550
<i>Central Provinces—</i>		
Bhandara . . . . .	19.8	1,876
<i>Madras—</i>		
Cuddapah . . . . .	13.5	5,400
<b>Total</b> . . . . .	<b>125.3</b>	<b>18,826</b>

The output of abrytes from the Kurnool district of Madras and Alwar State of Rajputana fell from a total of 2,507 tons, valued at Rs. 42,749 (£2,850), in 1923 to 2,303 tons, valued at Rs. 31,341 (£2,255). Of this total 783 tons, valued at Rs. 11,341, came from Kurnool, and the balance, 1,520 tons valued at Rs. 20,000, from the Alwar State.

There was a very large increase in the output of bauxite, from 6,547 tons, valued at Rs. 55,233 (£3,682 in 1923, to a total of 23,228 tons valued at Rs. 1,88,075 (£13,531), this total being made up of 19,738 tons valued at Rs. 1,77,640 produced by the Shivarajpur Syndicate, Limited, in the Kaira district, Bombay Presidency, and 3,490 tons valued at Rs. 10,435 produced by the Katni Cement and Industrial Company, Limited, in the Jubbulpore district.

0.71 cwt. of bismuth ore, valued at Rs. 240 (£17), was produced in the Tavoy district during 1924, presumably as a bye-product in the extraction of wolfram.

TABLE 31.—*Production of Building Materials and Road Metal in India during 1924.*

	GRANITE AND GNEISS.			LATERITE.		LIME.	LIMESTONE AND KANSAR.	MARBLE.	SANDSTONE.	SLATE.	TRAP.	MISCELLANEOUS.
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£	Tons.	£	Tons.	£	Tons.	£	Tons.	£
Assam	2,555	556	14,712	5,312	93,430	14,787	..	..	..	..	60,094	9,146
Baluchistan	..	..	..	..	2	14	..	..	..	..	..	..
Bihar and Orissa	274	96	13,205	33	6,705,707	139,709	..	..	146,965	2,826	7,303	19,345
Bombay	..	..	376	21	..	..	..	..	4,800	582	175	430
Burma	412,429	78,003	350,702	41,606	316,638	29,516	..	..	140,671	9,794	..	44,362
Central India	..	..	..	..	122,453	4,916	..	..	..	..	..	..
Central Provinces	..	..	14,825	15,325	333,425	45,286	..	..	..	..	..	..
Gwalior	..	..	404	468	..	..	..	..	..	..	..	..
Kashmir	..	..	..	..	15,878	719	..	..	19,255	4,190	7,240	(a)
Madras	..	..	1,788	2,878	..	..	..	..	..	..	..	..
Mysore	7,055	1,103	75,525	14,611	13,271	867	..	..	..	..	134,625	7,515
N.-W. P. Province	..	..	256	268	6,567,534	1,173	..	..	..	..	..	564
Punjab	..	..	..	..	2,416	141	..	..	..	..	..	..
Rajputana	..	..	..	..	18,732	1,211	..	..	..	..	..	..
United Provinces	..	..	..	..	129,710	12,197	5,615	12,635	131,036	36,754	..	59,896
..	..	..	..	..	43,029	4,082	..	..	..	..	1,852	491
<b>Total</b>	<b>421,993</b>	<b>79,718</b>	<b>693,521</b>	<b>77,211</b>	<b>25,969</b>	<b>1,851,455</b>	<b>26,477</b>	<b>5,618</b>	<b>22,625</b>	<b>448,787</b>	<b>13,400</b>	<b>12,855</b>
											<b>7,538</b>	<b>713</b>
											<b>2,493,920</b>	<b>219,972</b>

(The value in sterling has been calculated on the basis of £1 = Rs. 13 9).

(a) Not available.

(b) Includes 300,553 tons dolomite produced in Gangpur State for use as a flux in the iron and steel industry.

(c) Excludes 484 tons of magnesian limestone valued at Rs. 14,546 (£1,024) quarried in the Kolar district or use after calcination in the cyanide process on the goldfields.

The total estimated value of building stone and road-metal produced in the year under consideration was Rs. 1,01,90,326 (£733,117) (see table 34). Certain returns supplied in cubic feet have been converted into tons on the basis of certain assumed relations between volume and weight. The total increase in value is over 43 per cent. The recorded output of building materials and road metal now stands seventh in value amongst the Indian minerals. By far the most important item amongst the building materials, and the item for which the most complete returns are available, is limestone and kankar including dolomite, of which the total production during the year under review was 1,851,455 tons valued at £265,657. Attempts are being made to ascertain whether in future the figures of production of limestone can be subdivided according to use, whether for fluxing in the steel industry, for the manufacture of cement, or for general building purposes.

The recorded production of clay fell from 118,112 tons, valued at Rs. 3,20,333 (£21,356) in 1923 to 122,972 tons, valued at Rs. 3,49,979 (£25,178), in 1924. The decrease in quantity was more than an offset by an increase in value.

TABLE 35.—*Production of clays in India during 1924.*

	Quantity.	Value (£l Rs. 13-9).	
	Tons.	Rs.	£
Baluchistan . . . . .	(a)	500	36
Bengal . . . . .	26,544	54,457	3,918
Bihar and Orissa . . . . .	30,118	2,07,833	14,952
Burma . . . . .	27,239	29,206	2,101
Central India . . . . .	556	1,312	94
Central Provinces . . . . .	31,300	19,646	1,413
Delhi . . . . .	2,573	2,820	203
Gwalior . . . . .	475	4,017	289
Madras . . . . .	107	107	8
Mysore . . . . .	3,623	28,556	2,054
Rajputana . . . . .	437	1,525	110
<b>Total .</b>	<b>122,972</b>	<b>3,49,979</b>	<b>25,178</b>

(a) Not available.

There was an enormous fall in the total production of fuller's earth from 27,696 tons, valued at Rs. 57,168 (£3,811), in 1923, to 4,078 tons valued at Rs. 16,027 (£1,153), in 1924; and, as shown in table 36, this is mainly due to a fall in the production from Jodhpur State from 27,500 tons in 1923 to only 1,070 tons in 1924, balanced slightly by a considerable production from Mysore.

TABLE 36. *Production of Fuller's Earth during 1923 and 1924.*

	1923.			1924.		
	Quantity.	Value		Quantity.	Value	
		(£1	Rs. 15).		(£1- Rs. 13 9).	
	Tons.	Rs.	£	Tons.	Rs.	£
<i>Central Pro-</i> <i>vinces -</i> Jubbulpore .	80	393	26	19	93	7
<i>Mysore</i> .	..	..	..	2,534	364	26
<i>Rajputana -</i> Bikanir State	110	585	39	450	2,010	145
Jaisalmer .	6	90	6	5	85	6
Jodhpur .	27,500	56,100	3,740	1,070	13,475	969
<b>Total</b> .	<b>27,696</b>	<b>57,168</b>	<b>3,811</b>	<b>4,078</b>	<b>16,027</b>	<b>1,153</b>

In the previous Review it was stated that the mineral hitherto reported from Bikanir State in Rajputana as 'sweet lime,' the vernacular name for gypsum, had been found on examination to be deposited limestone, slightly tufaceous with a little sulphate. This statement proved to be erroneous, and was based upon an unfortunate laboratory error, but, in consequence of it, the production figures for 1923 were only about one-fourth of the true figures; the corrected figures with those for 1924 are shown in table 37 of this Review. The correct figures for 1923 are also shown in the Quinquennial Review of Mineral Production for 1919-23. From this it will be seen that the production of gypsum has fallen slightly from 39,297 tons, valued at Rs. 74,168 (£4,944), in 1923 to 38,123 tons, valued at Rs. 76,838 (£5,527), in the



year under review. A portion of the gypsum from Jamsar in Bikanir State is exported to South Bihar for use as a manure, for which purpose it is commonly applied to the extent of 2 maunds per acre.

TABLE 37.—*Production of Gypsum during 1923 and 1924.*

	1923.			1924.		
	Quantity.	Value (£1 Rs. 15).		Quantity.	Value (£1 Rs. 13 9).	
	Tons	Rs	£	Tons.	Rs.	£
<i>Kashmir</i> . . . . .	88	(a)	(a)	48	600	43
<i>Punjab</i> <i>Jhelum</i> . . . . .	5,197	1,547	303	4,947	1,927	354
<i>Rajputana</i> . . . . .						
<i>Bikanir</i> . . . . .	28,929	57,121	3,898	26,698	55,851	4,018
<i>Jaisalmer</i> . . . . .	83	500	33	125	823	59
<i>Murwar</i> . . . . .	5,000	12,000	800	6,325	14,637	1,053
<b>Total</b> . . . . .	<b>39,297</b>	<b>74,168</b>	<b>4,914</b>	<b>38,123</b>	<b>76,838</b>	<b>5,524</b>

(a) Value not available.

The output of ilmenite from Travancore State fell from 700 tons, valued at £2,100, in 1923 to 641 tons, valued at £1,381 in 1924.

Ilmenite.

There was a recorded output of 224 tons of kyanite, valued at Rs. 3,360 (£242), in the Kharsawan State (Singh-  
bhum) in 1924. This kyanite was doubtless obtained from Lopso Hill and was extracted for use as a refractory material.

Kyanite.

The total production of ochre in 1924 amounted to 6,304 tons, valued at Rs. 66,719 (£4,800), against 9,107 tons, valued at Rs. 67,142 (£4,476), in the preceding year. In spite of the decrease in the quantity of ochre produced there was, however, a slight increase in total value.

Ochrt.

TABLE 38. *Production of Ochre during the years 1923 and 1924.*

	1923.			1924.		
	Quantity.	Value (£1 Rs. 15).		Quantity.	Value (£1 Rs. 13-9).	
	Tons.	Rs.	£	Tons.	Rs.	£
Bihar and Orissa	441	11,078	738	300	7,665	551
Central India	1,183-6	35,609	2,374	4,100	40,760	2,932
Central Provinces	2,449	8,495	566	181	2,698	191
Gwahar	895	(a) 6,265	418	783	10,571	761
Madras	435	5,400	360	325	1,375	315
Rajputana	403-5	295	20	312	6-0	47
<b>Total</b>	<b>9,107-1</b>	<b>64,112</b>	<b>4,176</b>	<b>6,304</b>	<b>66,549</b>	<b>4,800</b>

(a) Estimated.

There was a production of 1-8 tons of serpentine, valued at Rs. 75 (£5-1), in the Ladak tahsil, Kashmir State, during 1924.

**Serpentine.**

There was an increase in the production of soda in the Ladak tahsil, Kashmir, from about 7 tons, valued at Rs. 249 (£17), in 1923, to 11-8 tons, valued at Rs. 430 (£31), in the year under review. Salt, consisting for the greater part of sodium carbonate, sodium bicarbonate and sodium chloride, is obtained by evaporation from the waters of the Lonar lake in the Buldana district of the Central Provinces. It is known under the general name of *trona* or *rasa*, for which there is no suitable equivalent in English. The total amount of *trona* extracted in 1924 was 20 tons, valued at Rs. 800 (£58), as against 600 tons, valued at Rs. 23,750 (£1,583), in 1923. There was also a production of 3-4 tons of crude soda (*vasi*), valued at Rs. 92 (£7), in Datta State, Central India.

**Soda.**

There was a great fall in the production of steatite from 7,023 tons, valued at Rs. 81,558 (£5,437), in 1923 to 2,852 tons, valued at Rs. 69,177 (£4,977), in 1924.

**Steatite.**

TABLE 39. — *Quantity and value of Steatite produced in India during the years 1923 and 1924.*

	1923.			1924.		
	Quantity.	Value (£1 Rs. 15).		Quantity.	Value (£1. Rs. 13 9).	
	Tons.	Rs.	£	Tons.	Rs.	£
<i>Bihar and Orissa—</i>						
Mayurbhanj .	65.0	6,000	400	67.0	6,200	447
Nilgiri .	..	..	..	(a)	3,500	252
Singhbhum .	76.8	4,424	295	63.8	3,359	241
Seraikela .	..	..	..	18.4	1,000	72
<i>Burma—</i>						
Pakokku Hill Tracts.	3.1	600	40	7.1	1,956	141
<i>Central India—</i>						
Bijawar .	0.4	64	4	..	..	..
<i>Central Provinces—</i>						
Jubbulpore .	990.0	9,249	617	1,675	17,597	1,266
<i>Madras—</i>						
Kurnool .	..	..	..	4	245	17
Nellore .	77.0	4,417	294	108	6,538	470
Salem .	890.2	20,947	1,396	804	19,748	1,421
<i>Mysore—</i>						
Mysore .	108.0	960	64	50	120	9
<i>United Provinces—</i>						
Hamirpur .	34.0	2,500	167	37	8,050	579
Jhansi .	4.0	192	13	18	(b) 864	62
<i>Rajputana—</i>						
Jaipur .	4,766	32,205	2,147	..	..	..
<b>Total</b>	<b>7,023.5</b>	<b>81,558</b>	<b>5,437</b>	<b>2,852.3</b>	<b>69,177</b>	<b>4,977</b>

(a) Not available.

(b) Estimated.

The production of zircon in the Travancore State rose from 145 tons, valued at £1,160, in 1923 to 365 tons, valued at £2,717 in 1924.

Zircon.

## IV.—MINERAL CONCESSIONS GRANTED.

TABLE 40. *Statement of Mineral Concessions granted during the year 1924.*

## ASSAM.

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Cachar .	(1) Whitehall Petroleum Corporation, Limited.	Crude petroleum and its associated hydro-carbons.	P. L. .	4,934 4	7th February 1924.	1 year.
Do. .	(2) Do. . .	Do. . .	P. L. .	2,496	Do. .	Do.
Do. .	(3) Do. . .	Do. . .	P. L. .	2,208	Do. .	Do.
Garo Hills .	(4) Messrs. Gallanders Arbuthnot and Company, Calcutta, on behalf of the Garo Hills Mining Syndicate.	Coal . . .	P. L. (renewal).	6,700 8	9th May 1924	Do.
Kamrup .	(5) Messrs. Birkenyrie Brothers.	Oil and coal .	P. L. .	4,665 6	19th May 1924.	Oil 2 years, Coal 1 year.
Jharsia and Jaintia Hills.	(6) The Garo Hills Mining Syndicate.	Coal . . .	P. L. .	2,880	6th November 1924.	1 year.
Lakhimpur	(7) The Assam Oil Company, Limited.	Do. . .	P. L. .	3,328	5th February 1924.	Do.
Do. .	(8) Do. . .	Coal and oil .	P. L. .	9,792	7th October 1922.*	Coal 1 year, Oil 2 years.
Do. .	(9) Do. . .	Oil . . .	P. L. .	842	23rd April 1924.	2 years.
Nowgong .	(10) Whitehall Petroleum Corporation, Limited.	Crude petroleum and its associated hydro-carbon.	P. L. .	1,920	20th March 1924.	1 year.
Do. .	(11) Do. . .	Do. . .	P. L. .	1,744	Do. .	Do.
Sadiya Frontier Tract.	(12) The Assam Oil Company, Limited.	Mineral oil .	P. L. .	2,240	19th December 1924.	Do.
Sylhet .	(13) The Indo-Burma Petroleum Company, Limited.	Do. .	P. L. .	796 8	19th March 1924.	2 years.
Do. .	(14) Do. . .	Do. . .	P. L. .	9,939 20	26th May 1924.	1 year.

P. L.=*Prospecting License.*

\* Executed on 5th February, 1924.

## BALUCHISTAN.

DISTRICT.	Grantee	Mineral.	Nature of grant	Area in acres.	Date of commencement.	Term.
Kalat	(1.) Burma Oil Co., Ltd.	Oil	P. L.	180	1st August 1921.	1 year.
Do	(16) Messrs. Sorabji and Sons of Quetta.	Coal and dust.	M. L.	80	1st January 1921.	30 years.
Sibi	(17) Mr. Tikam Dass Gurdiani Dass	Coal	M. L.	80	11th October 1921.	Do.
Zhob	(18) The Baluchistan Chrome Co., Ltd. Hudubagh.	Chromite	M. L.	10	20th August 1924.	Do.
Do	(19) Do	Do.	M. L.	10	Do.	Do.
Do.	(20) Do.	Do.	M. L.	10	Do.	Do.
Do.	(21) Do.	Do.	M. L.	10	13th November 1921	Do.
Do.	(22) Do.	Do.	M. L.	10	Do.	Do.
Do.	(23) Do.	Do.	M. L.	20	Do.	Do.
Do.	(24) Do.	Minerals or Mineral oils	E. L.	102,400	29th January 1921.	1 year.

## BIHAR AND ORISSA.

Angul	(25) Vellore Colliery Company, Ltd	Coal, iron and other minerals	P. L.	25,600	21st June 1921.	1 year.
Do.	(26) Dibakar Patnaik	Red ochre	P. L.	6,400	Not stated	Do.
Santal Parganas.	(27) Bansi Ram Marwar	Coal	M. L.	0 83	1st April 1924.	2 years.
Sambalpur	(28) Messrs. Bird & Company, Calcutta.	Haematite and manganese	M. L.	1,836 8	8th May 1924.	30 years.
Do	(29) The Indian Iron and Steel Company, Limited, Calcutta.	Iron ore and manganese.	M. L.	225 20	1st January 1921.	2 years.
Do.	(30) Babu Mangi Lal Marwar, Chabassa.	Iron ore	P. L.	221	1st July 1921	1 year.
Do.	(31) Babu Hiralal Sarda, Chabassa.	Manganese	P. L.	47 15	29th May 1921.	Do.
Do.	(32) Do.	Do.	P. L.	233 79	29th May 1921.	Do.
Do.	(33) The Bengal Iron Co., Ltd., Kulti.	Iron ore	M. L.	118 10	1st June 1924	3 years.
Do.	(34) The Hon'ble Maharaja Su Manindra Chandra Nandy, K.C.I.E., of Kashiabazar.	Chromite	M. L.	143 00	Lease, dated 12th May 1924 granted with effect from 11th December 1921.	30 years.
Do.	(35) Do.	Manganese	M. L.	573	Do.	Do.
Do.	(36) The Tata Iron and Steel Co., Ltd., Bombay.	Iron ore	M. L.	361 0	1st January 1924. (a)	Do.

P. L. = Prospecting License. M. L. = Mining Lease. E. L. = Exploring License.

(a) Lease not yet executed.

## BOMBAY PRESIDENCY.

DISTRICT.	Grantee.	Mineral	Nature of Grant.	Area in acres.	Date of commencement.	Term.
Belgaum .	(37) Mr. A. V. Kulkarni	Manganese .	P. L. .	319.98	8th February 1924.	1 year.
Kanara .	(38) Mr. P. B. Kantharia of Bombay.	Do. . .	P. L. .	116	29th March 1924.	Do.
Do. .	(39) Messrs. D. M. Tilve & Sons of Bombay.	Do. . .	P. L. .	10.3	8th April 1924.	Do.
Do. .	(40) Mr. P. B. Kantharia of Bombay.	Do. . .	P. L. .	Not known .	..	..

## BURMA.

Akyab	(41) Messrs. The Indo-Burma Petroleum Co., Ltd., Rangoon.	Natural petroleum	P. L. (renewal)	4,800	19th January 1924.	1 year.
Do	(42) Do. . .	Do. . .	P. L. (renewal)	1,240	22nd April 1924.	Do.
Do.	(43) Messrs. The Burma Oil Co., Ltd., Rangoon	Do. . .	P. L. (renewal)	3,620	16th July 1924.	Do.
Do .	(44) Maung Choon .	Do. . .	P. L. .	638.27	24th October 1924.	1 or 2 years as the applicant likes.
Aungmye	(45) Messrs. The Yawm Tin, Ltd.	Tin Ore . . .	M. L. .	2,880	16th November 1924.	30 years.
Do .	(46) Maung Myat Hein.	Do. . .	M. L. .	639.92	23rd April 1924.	Do.
Do. .	(47) Maung Po Thaing and Po Kim.	All minerals except oil.	P. L. (renewal)	12.80	26th September 1923.	1 year.
Do .	(48) Maung Hte. .	Do. . .	P. L. (renewal)	640	..	Do.
Bhamo .	(49) Messrs. The Yawm Tin Syndicate	All minerals except natural petroleum and precious stones.	P. L. (renewal)	3,328	25th August 1924.	Do.
Heinzada .	(50) Mr. L. D'Almeida	Copper pyrites .	M. L. .	94.76	24th October 1924.	30 years.
Katha .	(51) Ma Ma . .	All minerals except oil.	P. L. .	3,520	4th January 1924.	1 year.
Do. .	(52) Ma Shwe Bwin .	Do. . .	P. L. (renewal)	640	6th November 1924.	Do.
L o w e r Chindwin.	(53) Messrs. The Burma Oil Co., Ltd.	Natural petroleum	P. L. .	2,560	13th November 1924.	2 years.
Do. .	(54) Maung Po Kyan	Do. . .	P. L. (renewal)	2,080	22nd September 1923.	1 year.

*P. L.* = *Prospecting License.* *M. L.* = *Mining Lease.*

BURMA--*contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Lower Chin (win.	(55) Messrs. The Burma Oil Co., Ltd.	Natural petroleum	P. L. (renewal.)	640	24th January 1921.	2 years.
Do.	(56) Mr. Lawrence Dawson.	Do.	P. L. (renewal.)	3,003	16th February 1921.	1 year.
Do.	(57) Messrs. The Indo-Burma Petroleum Co., Ltd.	Do.	P. L. (renewal.)	9,600	5th July 1924	Do.
Do.	(58) Do.	Do.	P. L. (renewal.)	1,920	1st August 1924.	Do.
Do.	(59) Do.	Do.	P. L. (renewal.)	3,200	22nd September 1924.	Do.
Do.	(60) Do.	Do.	P. L. (renewal.)	8,576	24th September 1924.	Do.
Mazwe	(61) Maung Po San	Do.	P. L.	320	8th December 1924.	2 years.
Do.	(62) Messrs. The Hensford Development Syndicate.	Do.	P. L.	640	26th November 1924.	Do.
Do.	(63) Maung Khin Oil Co.	Do.	M. L.	610	7th March 1922	30 years.
Do.	(64) Messrs. The Yenaigyaung Oil Field Southern Extension Ltd.	Do.	M. L.	610	7th March 1922.	Do.
Do.	(65) Messrs. The Upper Burma Oil Syndicate.	Do.	P. L. (renewal.)	76	16th November 1923.	1 year.
Do.	(66) Do.	Do.	P. L. (renewal.)	3,840	16th January 1924.	Do.
Do.	(67) Messrs. The Union Oil Co., Ltd.	Do.	P. L. (renewal.)	3,840	21st January 1924.	Do.
Do.	(68) Maung Po Tun	Do.	P. L. (renewal.)	1,280	21st April 1924.	Do.
Do.	(69) Mr. J. W. H. Fenner.	Do.	P. L. (renewal.)	2,560	26th April 1924.	Do.
Do.	(70) Messrs. The Burma Oil Company Limited.	Do.	P. L. (renewal.)	3,940	2nd June 1924.	Do.
Do.	(71) Messrs. The Upper Burma Oil Syndicate.	Do.	P. L. (renewal.)	1,200	12th May 1924.	Do.
Do.	(72) Messrs. The Burma Oil Company Limited.	Do.	P. L. (renewal.)	2,259	25th June 1924.	Do.
Do.	(73) Messrs. The Upper Burma Oil Syndicate.	Do.	P. L. (renewal.)	1,440	11th July 1924.	Do.
Do.	(74) Messrs. The Union Oil Co., Ltd.	Do.	P. L. (renewal.)	980	20th August 1924.	Do.

BURMA *contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres	Date of commencement.	Term.
Magwe .	(75) Messrs. The Upper Burma Oil Syndicate.	Natural petroleum	P. L. (renewal).	840	19th August 1924.	1 year.
Do. .	(76) Do. . .	Do. . .	P. L. (renewal).	3,200	4th August 1924.	Do.
Mandalay .	(77) Messrs. Steel Bros & Co., Ltd., Rangoon.	All minerals except oil.	P. L. (renewal).	2,000	1st October 1923.	2 years.
Do. .	(78) Messrs. The Burma Corporation, Ltd., Nampin.	Iron ore . .	P. L. .	610	16th June 1924.	1 year.
Meiktila .	(79) Messrs. The Burma Oil Co., Ltd., Rangoon.	Natural petroleum	P. L. (renewal).	1,850	13th December 1924.	Do.
Mergui .	(80) Mr. C. Chan Shwe	All minerals except oil.	P. L. .	1,484.8	21st July 1924.	Do.
Do. .	(81) Maung Po Thaik	Tin ore . .	P. L. .	1,971.2	24th April 1924.	Do.
Do. .	(82) Tan Po Chit .	All minerals except oil.	P. L. .	611.4	30th July 1924.	Do.
Do. .	(83) Mr. J. I. Milne .	Tin and all minerals except oil.	P. L. .	1,341.44	11th January 1924.	Do.
Do. .	(84) Mr. P. B. O. Watson.	Tin and allied minerals.	P. L. .	640	25th June 1924.	Do.
Do. .	(85) Mr. J. I. Milne .	All minerals except oil.	P. L. .	1,080.32	11th January 1924.	Do.
Do. .	(86) Mr. Chan Khain Lock.	Do. . .	P. L. .	860.16	22nd February 1924.	Do.
Do. .	(87) Mr. Joo Seng .	Tin ore . .	P. L. .	522.24	11th October 1924.	Do.
Do. .	(88) Lim Oo Ghine .	Tin and allied metal.	P. L. .	1,740.8	15th October 1924.	Do.
Do. .	(89) Maung Pan On .	Tin ore . .	P. L. .	71.08	17th December 1924.	Do.
Do. .	(90) Tan Telk Aik .	Tin ore and wolfram.	P. L. .	1,295.36	3rd March 1924.	Do.
Do. .	(91) In Sit Yan .	Tin and other minerals.	P. L. .	914.16	25th February 1924.	Do.
Do. .	(92) Do. . .	Do. . .	P. L. .	583.68	17th January 1924.	Do.
Do. .	(93) Mr. A. Herbert Noyes.	Cassiterite . .	P. L. .	614.63	15th January 1924.	Do.
Do. .	(94) Mr. J. I. Milne .	All minerals except oil.	P. L. .	634.88	23rd July 1924.	Do.
Do. .	(95) Mr. A. M. G. Forbes.	Tin ore . .	P. L. .	901.12	16th August 1924.	Do.
Do. .	(96) Mr. Joo Seng .	Do. . .	P. L. .	435.2	22nd July 1924.	Do.



BURMA- *contd.*

DISTRICT.	Grantee.	Mineral	Nature of grant.	Area in acres	Date of commencement.	Term.
Mergui	(97) Mr. Warwick Smith.	All minerals except mineral oil.	P. L.	1,250 52	12th November 1924.	1 year.
Do.	(98) Mr. Lim Go Ghino	Tin and other allied metal.	P. L.	650 24	29th August 1924.	Do.
Do.	(99) Mr. Warwick Smith.	Tin and all minerals except mineral oil.	P. L.	650 24	23rd July 1924.	Do.
Do.	(100) In Sit Yat	Tin and other minerals.	P. L.	621 64	6th August 1924.	Do.
Do.	(101) Mr. E. Ahmed	Tin . . .	P. L.	1,000 96	2nd October 1924.	Do.
Do.	(102) Mr. S. Warwick Smith.	Tin and all minerals except oil.	P. L.	834 56	20th December 1924.	Do.
Do.	(103) Dr. San Moe	Tin and allied minerals.	P. L.	609 28	28th November 1924.	Do.
Do.	(104) Mr. A. E. Ahmed	Tin ore . . .	P. L.	558 08	10th September 1924.	Do.
Do.	(105) Mr. Joo Seng	All minerals except oil.	P. L.	471 04	Do.	Do.
Do.	(106) Mr. E. Ahmed	Do. . .	P. L.	1,262 08	16th December 1924.	Do.
Do.	(107) Mr. A. S. Mahomed.	Tin ore . . .	P. L.	1,290 94	12th August 1924.	Do.
Do.	(108) Maung San Dun	Do. . .	P. L.	614 40	29th October 1924.	Do.
Do.	(109) Dr. San Moe	Tin and allied minerals.	P. L.	1,440	22nd August 1924.	Do.
Do.	(110) Mr. P. B. O. Watson.	Do . . .	P. L.	634 88	2nd October 1924.	Do.
Do.	(111) Mr. Md. Haniff	Tin ore . . .	P. L.	655 36	1st September 1924.	Do.
Do.	(112) Mr. S. Warwick Smith.	Tin and all minerals except oil.	P. L.	2,073 60	12th November 1924.	Do.
Do.	(113) In Sit Yan	Tin and other minerals.	P. L.	634 88	19th September 1924.	Do.
Do.	(114) Mr. Joo Seng	All minerals except oil.	P. L.	478 16	10th October 1924.	Do.
Do.	(115) Tan Po Chit	Do. . .	P. L.	588	1st December 1924.	Do.
Do.	(116) Teoh Teik Hoo	Tin ore . . .	P. L.	430 08	25th November 1924.	Do.
Do.	(117) Mr. J. T. Doupe	Tin and other allied minerals.	P. L.	2,320 60	19th November 1924.	Do.
Do.	(118) Mr. C. Chan Shwe.	All minerals except oil.	M. L.	1,674 24	7th February 1924.	30 years.

BURMA—*contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Margui	(119) Mr Charles Kitchen	All minerals except oil	M. L.	710.89	31st January 1921.	21 years.
Do.	(120) Ma Kym Mya and Ma Lun.	Tim . . . .	M. L.	609.28	11th August 1921.	30 years.
Do.	(121) Mess. S. M. G. Penny.	Tin and wolfram	M. L.	3,527.68	1st January 1921.	Do.
Do.	(122) Ba Chub . .	Tim . . . .	P. L. (renewal)	130.08	25th October 1922.	2 years.
Do.	(123) Messrs. The Austral Malay Tin Ltd.	Tin ore . . .	P. L. (renewal)	2,135.04	5th December 1924.	1 year.
Do.	(124) Mr Jas. McGreor	Tin and allied minerals.	P. L. (renewal)	660.18	2nd January 1924.	Do.
Do.	(125) Maung San Dun	Do. . . .	P. L. (renewal)	281.60	16th March 1924.	Do.
Do.	(126) Mr A. S. Mahmood.	Tin . . . .	P. L. (renewal)	614	12th February 1924.	Do.
Do.	(127) Maung Chon .	Tin and allied minerals	P. L. (renewal)	271.36	5th February 1924.	Do.
Do.	(128) Mr. A. S. Mahmood.	All minerals except oil.	P. L. (renewal)	704	20th December 1922.	2 years.
Do.	(129) Mr. A. M. G. Forbes.	Tin ore . . .	P. L. (renewal)	1,131.52	26th February 1924.	1 year.
Do.	(130) Maung San Moe	Do. . . .	P. L. (renewal)	998.40	16th June 1924.	Do.
Do.	(131) Mr Joo Seng .	Do. . . .	P. L. (renewal)	358.10	3rd November 1924.	Do.
Do.	(132) Mr V. A. R. Southland.	Tin and allied minerals.	P. L. (renewal)	2,682.88	21st June 1924.	Do.
Mabui	(133) Messrs. The Burma Finance and Mining Co., Ltd.	All kinds of minerals including natural petroleum.	P. L.	1,920	28th May 1923.	Do.
Do.	(134) Do. . . .	Natural petroleum	P. L.	2,560	6th June 1923.	Do.
Do.	(135) Messrs. The British Burma Petroleum Co., Ltd.	Do. . . .	M. L.	356	28th February 1923.	30 years.
Do.	(136) Messrs. The Indo-Burma Petroleum Co., Ltd.	Do. . . .	P. L. (renewal)	1,926.85	5th January 1924.	1 year.
Mingyan	(137) Maung Aet and One.	Do. . . .	P. L. (renewal)	100	3rd November 1923.	Do.
Do.	(138) Messrs. The Burma Oil Co., Ltd.	Do. . . .	P. L. (renewal)	1,621.12	20th December 1923.	Do.
Do.	(139) Do. . . .	Do. . . .	P. L. (renewal)	2,813.41	22nd December 1923.	Do.
Do.	(140) Do. . . .	Do. . . .	P. L. (renewal)	1,760	7th May 1924	Do.

P. L. = *Prospecting Licence.* M. L. = *Mining Lease.*

BURMA—*contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Myingyan .	(141) Messrs. The Burma Oil Co., Ltd.	Natural petroleum	P. L. (renewal).	2,960	5th July 1924	1 year
Do. .	(142) Messrs. The Union Oil Co., Ltd.	Do. . .	P. L. (renewal).	6,720	17th September 1924.	Do.
Do. .	(143) Messrs. The Burma Oil Co., Ltd.	Do. . .	P. L. (renewal).	1,158.4	Do. .	Do.
Myitkyina .	(144) Messrs. The Austral Malay Tin Co., Ltd.	Gold . . .	P. L. .	9,984	17th June 1924.	Do.
Northern Shan States.	(145) Klu Maung .	All kinds of minerals and precious stones.	P. L. .	1,920	20th August 1924.	Do.
Do. .	(146) Messrs. The Burma Corporation Ltd., Nanttu	All minerals except oil. . .	P. L. (renewal).	640	1st October 1923.	Do.
Do. .	(147) Do. . .	Iron ore . . .	P. L. (renewal).	160	8th May 1924	Do.
Do. .	(148) Do. . .	Do. . .	P. L. (renewal).	385	1st June 1924	Do.
Do. .	(149) Saw Hke, Hsipaw Sawbwa.	Coal and Iron .	P. L. (renewal).	3,238.4	15th June 1924.	Do.
Do. .	(150) Messrs. The Burma Corporation, Ltd., Nanttu.	All minerals except oil.	P. L. (renewal).	640	1st October 1924.	Do.
Pakokku .	(151) Maung U Khin	Natural petroleum	P. L. .	220	28th February 1924.	2 years.
Do. .	(152) Messrs. The Indo-Burma Petroleum Co., Ltd.	Do. . .	P. L. .	2,400	3rd April 1924.	Do.
Do. .	(153) Messrs. The British Burma Petroleum Co., Ltd.	Do. . .	P. L. .	2,880	1st December 1923.	Do.
Do. .	(154) The Nathsingh Oil Co., Ltd.	Do. . .	P. L. .	4,160	Not stated .	1 year.
Do. .	(155) Messrs. The Nathsingh Oil Co., Ltd.	Do. . .	P. L. (renewal).	2,240	24th March 1923.	2 years.
Do. .	(156) Mr. Colin Campbell.	Do. . .	P. L. (renewal).	544.4	22nd November 1923.	1 year.
Do. .	(157) Do. . .	Do. . .	P. L. (renewal).	2,041.6	3rd March 1924.	Do.
Do. .	(158) Messrs. The Indo-Burma Petroleum Co., Ltd.	Do. . .	P. L. (renewal).	800	4th February 1924.	Do.
Do. .	(159) Mr. Baijnath Singh.	Do. . .	P. L. (renewal).	2,400	28th March 1924.	Do.
Do. .	(160) Messrs. Rowland Ayl & Co.	Do. . .	P. L. (renewal).	2,400	1st August 1924.	Do.

BURMA—*contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Pakokku .	(161) Ma Zan . .	Natural petroleum	P. L. (renewal).	100	30th June 1924.	1 year.
Prome .	(162) Ma Nyan Hla .	Do. . .	M. L. .	123	25th January 1925.	30 years.
Do. .	(163) Messrs. The Yoma Oil Co.	Do. . .	M. L. .	2,386.23	22nd July 1924.	Do.
Do. .	(164) Messrs. The British Burma Petroleum Co., Ltd.	Do. . .	P. L. .	3,200	29th July 1924.	1 year.
Do. .	(165) Ma Po Ni .	Do. . .	P. L. (renewal).	46.08	22nd December 1923.	Do.
Do. .	(166) Mr. G. Govindaram.	Do. . .	P. L. (renewal).	110.08	22nd March 1924.	Do.
Sarawing .	(167) Messrs. The Indo-Burma Petroleum Co., Ltd.	Do. . .	P. L. .	7,040	17th July 1924.	Do.
Salween .	(168) Messrs. The Austral Malay Tin Ltd.	Gold . . .	P. L. .	19,200	8th August 1924.	Do.
Shwelo .	(169) Messrs. The Burma Oil Co., Ltd.	Natural petroleum	P. L. (renewal).	2,880	14th August 1924.	Do.
Do. .	(170) Messrs. The Indo-Burma Petroleum Co., Ltd.	Do. . .	P. L. (renewal).	2,560	1st October 1924.	Do.
Do. .	(171) Do. . .	Do. . .	P. L. (renewal).	2,560	2nd May 1924.	Do.
Do. .	(172) Do. . .	Do. . .	P. L. (renewal).	5,440	14th August 1924.	Do.
Do. .	(173) Messrs. The Burma Oil Co., Ltd.	Do. . .	P. L. (renewal).	2,880	2nd December 1924.	Do.
Southern Shan States	(174) Ma Saw Lon .	Lead and silver .	M. L. .	2.11	1st September 1922.	5 years.
Do. .	(175) Messrs. The Burma Finance and Mining Co., Ltd.	All minerals except oil.	P. L. .	2,227.20	Not stated .	1 year.
Do. .	(176) Messrs. Steel Bros. & Co., Ltd.	Do. . .	P. L. .	1,575	1st July 1924	Do.
Do. .	(177) Major F. M. Ball	Do. . .	P. L. .	640	1st April 1924	Do.
Do. .	(178) Mr. Colin Campbell.	Do. . .	P. L. .	2,144	7th August 1924.	Do.
Do. .	(179) Do. . .	Do. . .	P. L. .	2,880	18th November 1924.	Do.
Do. .	(180) Mr. H. F. Leslie	Do. . .	P. L. .	6,213	17th July 1924.	Do.
Do. .	(181) Mr. Colin Campbell.	Do. . .	P. L. .	2,880	25th November 1924.	Do.

P. L. = Prospecting License. M. L. = Mining Lease.

BURMA—*contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Southern Shan States	(182) Major F. M. Ball	All minerals except oil.	P. L.	2,000	31st December 1921.	1 year.
Do.	(183) Mr. Mohamed Din.	Do.	P. L.	4,180		Do.
Do.	(184) Dawmi & Sons	Do.	P. L.	610	31st December 1921.	Do.
Do.	(185) Kengtung Saw-bwa.	Natural petroleum	P. L. (renewal).	1,280	15th August 1923.	2 years.
Do.	(186) Do.	Do.	P. L. (renewal)	1,380	Do.	Do.
Tavoy	(187) Mr. J. J. A. Page	Tin and wolfram	P. L.	584	5th April 1921	1 year
Do.	(188) Mr. Quah Cheng Guan.	All minerals except oil.	P. L.	735	2nd January 1921.	Do.
Do.	(189) Mr. A. W. Ross.	Tin and wolfram	P. L.	1,216	21st February 1921.	Do.
Do.	(190) Mr. J. T. Doupe	All minerals except oil.	P. L.	1,133	12th January 1921.	Do.
Do.	(191) Mr. M. T. Dunstan.	Tin and wolfram	P. L.	317	2nd January 1921.	Do.
Do.	(192) Quah Cheng Guan.	All minerals except oil.	P. L.	566	Do.	Do.
Do.	(193) Mr. H. Kim Chu	Tin and allied minerals.	P. L.	312	25th March 1921.	Do.
Do.	(194) Mr. M. T. Dunstan.	Tin and wolfram	P. L.	19	2nd January 1921.	Do.
Do.	(195) Mr. W. C. Toms	Tin and allied metals.	P. L.	637	3rd March 1921.	Do.
Do.	(196) The Tavoy Tin Dredging Corporation, Ltd.	All minerals except oil.	P. L.	190	9th August 1921.	Do.
Do.	(197) Mr. T. J. Mackey	Tin and wolfram	P. L.	102	8th March 1921.	Do.
Do.	(198) Mr. H. Kim Chu	Tin and allied metals.	P. L.	315	25th March 1921.	Do.
Do.	(199) Mr. Ni Toe	All minerals except oil.	P. L.	160	20th March 1921.	Do.
Do.	(200) Quah Cheng Guan.	Do.	P. L.	256	24th June 1921.	Do.
Do.	(201) Mr. Maung	Tin and wolfram	P. L.	616	21st March 1921.	Do.
Do.	(202) Mr. W. C. Toms	All minerals except oil.	P. L.	635	10th July 1921.	Do.
Do.	(203) Quah Cheng Tock.	Do.	P. L.	867	12th June 1921.	Do.
Do.	(204) Mr. H. Kim Chu	Tin and allied minerals.	P. L.	180	7th August 1921.	Do.

P. L. = Prospecting License.  
 \* Not yet known.

BURMA—*contd.*

DISTRICT	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Tavoy	(205) Mr. A. W. Ross.	Tin . . . .	P. L. . .	256	26th November 1924.	1 year.
Do.	(206) Maung Po Pe .	All minerals except oil.	P. L. . .	425	6th June 1924	Do.
Do.	(207) Maung Maung	Tin and wolfram	P. L. . .	320	15th September 1924.	Do.
Do.	(208) Do.	Do. . . .	P. L. . .	285	30th July 1924.	Do.
Do.	(209) Mr. H. Kim Chu	Tin and allied metals	P. L. . .	640	*	Do.
Do.	(210) Maung Maung .	Tin and wolfram	P. L. . .	176	25th June 1924.	Do.
Do.	(211) Ma Yai . . .	Do. . . .	P. L. . .	640	8th November 1924	Do.
Do.	(212) Mr. T. J. Mackey	Do. . . .	P. L. . .	825	20th October 1924	Do.
Do.	(213) Mr. G. Lovell .	All minerals except oil	P. L. . .	123	30th September 1924.	Do.
Do.	(214) Mr. Wong Chien	Tin and allied minerals.	P. L. . .	640	12th November 1924.	Do.
Do.	(215) Maung Po Pe	All minerals except oil	P. L. . .	390	9th August 1924	Do.
Do.	(216) Mr. H. Kelly .	Tin and other minerals.	P. L. . .	400	24th July 1924.	Do.
Do.	(217) Mr. A. W. Ross	Tin . . . .	P. L. . .	162 .5	6th October 1924	Do.
Do.	(218) Mr. H. Kelly	Tin and allied minerals.	P. L. . .	1,656	3rd December 1924.	Do.
Do.	(219) Mr. H. Kim Chu	Do. . . .	P. L. . .	500	1st December 1924.	Do.
Do.	(220) Mr. Mamode Assetjee	All minerals except oil	P. L. . .	286	25th November 1924.	Do.
Do.	(221) Mr. W. C. Tones	Tin and allied minerals.	P. L. . .	350	12th December 1924.	Do.
Do.	(222) Mr. Quah Cheung Guan	All minerals except natural petroleum and precious stones.	M. L.	236.73	8th January 1924	30 years.
Do.	(223) Mr. Lee Jauk Seang.	Tin and wolfram .	P. L. (renewal).	293.68	10th January 1924.	1 year.
Do.	(224) Mr. G. Willson	Do. . . .	P. L. (renewal).	520	11th December 1923.	Do.
Do.	(225) Ma Yai . . .	Do. . . .	P. L. (renewal)	305.92	20th January 1924.	2 years.
Do.	(226) Messrs. The Tavoy Tin Dredging Corporation, Ltd.	All minerals except oil.	P. L. (renewal).	144	30th January 1924.	1 year.

P. L. = *Prospecting Licence.* M. L. = *Mining Lease.*

\* Not yet known.

BURMA.—*contd.*

DISTRICT	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Tavoy	(227) Mr. R. C. N. Twite.	Tin and allied minerals.	P. L. (renewal).	117	30th January 1924.	2 years.
Do.	(228) Mr. M. T. Dunstan.	Do. . .	P. L. (renewal).	1,763 1	31st January 1924.	1 year.
Do.	(229) Mr. H. Kim Chu	Do. . .	P. L. (renewal).	(a)277	19th February 1924.	2 years.
Do.	(230) Mr. G. Lovell	Tin and wolfram .	P. L. (renewal).	218	17th April 1924.	1 year.
Do.	(231) Maung Maung	Do. . .	P. L. (renewal).	640	25th May 1924.	Do.
Do.	(232) Mr. M. T. Dunstan.	Do. . .	P. L. (renewal).	1,088	6th July 1924.	Do.
Do.	(233) Maung Ni Toe	All minerals except oil.	P. L. (renewal).	(a)170	17th August 1924.	Do.
Do.	(234) The Tavoy (c) Tin Dredging Corporation, Ltd.	Tin . . .	P. L. (renewal).	12.5	21st August 1924.	Do.
Do.	(235) Ong Hoe Kyin	Tin and wolfram .	P. L. (renewal).	(a)110	10th September 1924.	Do.
Do.	(236) Mr. M. T. Dunstan.	Do. . .	P. L. (renewal).	170	1st October 1924.	Do.
Thahton	(237) Maung Chit Maung.	Tin . . .	M. L. .	687.78	11th April 1919.	30 years
Do.	(238) Maung Pu	Do. . .	P. L. (renewal).	505 60	23rd July 1924.	1 year.
Thayetmyo	(239) Messrs. The Indo-Burma Petroleum Co., Ltd., Rangoon.	Natural petroleum	P. L. .	6,400	28th April 1924.	2 years.
Do.	(240) Messrs. The Indo-Burma Oil Fields.	Do. . .	P. L. .	30,720	22nd February 1924.	Do.
Do.	(241) Messrs. The British Burma Petroleum Co., Ltd., Rangoon.	Do. . .	P. L. .	3,000 96	19th September 1924.	Do.
Do.	(242) Maung Hmon	Do. . .	P. L. .	480	14th July 1924.	Do.
Do.	(243) Messrs. The Indo-Burma Oil Fields, Ltd., Thayetmyo.	Do. . .	P. L. .	638	1st December 1924.	Do.
Do.	(244) Messrs. The Indo-Burma Oil Co., Ltd., Rangoon.	Do. . .	P. L. .	2,921 8	29th November 1924.	Do.
Do.	(245) Messrs. The British Burma Petroleum Co., Ltd., Yenangyaung.	Do. . .	P. L. .	1,216	24th November 1924.	Do.
Do.	(246) Messrs. The Indo-Burma Oilfield, Ltd., Thayetmyo.	Do. . .	P. L. (renewal).	4,800	6th October 1923.	1 year.

P. L. = Prospecting License. M. L. = Mining Lease.  
 (a) Area revised on renewal.  
 (c) Formerly Indo-Burma Tin Corporation, Ltd.

## BURMA--contd.

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Thayetmyo	(247) Mr. Rowland Ayl., Rangoon	Natural petroleum	P. L. (renewal).	3,008	13th January 1924.	1 year.
Do.	(248) Ismail Abou Ahmed.	Do.	P. L. (renewal).	2,400	15th January 1924.	Do.
Do.	(249) Mr. Colin Campbell, Rangoon.	Do.	P. L. (renewal).	2,995.2	16th January 1924.	Do.
Do.	(250) Omar Abu Bucker	Do.	P. L. (renewal).	2,560	23rd February 1924.	Do.
Do.	(251) Messrs. The Indo-Burma Oil-field, Ltd., Thayetmyo.	Do.	P. L. (renewal).	2,560	11th December 1923.	Do.
Do.	(252) Do.	Do.	P. L. (renewal).	5,945.6	15th February 1924.	Do.
Do.	(253) Do.	Do.	P. L. (renewal).	6,886.4	23rd January 1924.	Do.
Do.	(254) Do.	Do.	P. L. (renewal).	192	26th April 1924.	Do.
Do.	(255) Do.	Do.	P. L. (renewal).	2,560	12th July 1924.	Do.
Do.	(256) Mr. D. M. Akhoun, Thayetmyo.	Do.	P. L. (renewal).	640	2nd July 1924	Do.
Do.	(257) Mr. Colin Campbell, Rangoon.	Do.	P. L. (renewal).	1,408	11th July 1924.	Do.
Do.	(258) Maung Tun Aung Gyaw, Thayetmyo.	Do.	P. L. (renewal).	100	3rd July 1924	Do.
Do.	(259) The Union Oil Co., Ltd., Rangoon.	Do.	P. L. (renewal).	3,712	14th September 1924.	Do.
Upper Chin- win.	(260) Acha Bibi	All minerals except oil.	P. L.	5,689.6	13th December 1924.	Do.
Do.	(261) Messrs. The Indo-Burma Petroleum Co., Ltd., Rangoon	Natural petroleum	P. L.	640	6th October 1924.	Do.
Do.	(262) Do.	Do.	P. L.	1,600	*	Do.
Do.	(263) Do.	Do.	P. L. (renewal).	12,800	12th September 1923.	License extended, till a M. L. issued.
Do.	(264) Messrs. The Coal-fields of Burma, Ltd. Maymyo.	Coal	P. L. (renewal).	1,632	15th September 1923.	1 year.
Do.	(265) Do.	Do.	P. L. (renewal).	2,188.8	31st August 1923.	Do.

P. L. = Prospecting License.

\* Not yet known.



BURMA—*concl'd.*

DISTRICT.	Grantee	Mineral	Nature of grant	Area in acres	Date of commencement.	Term.
Upper Chinthe	(266) Messrs. The Indo-Burma Oil-fields, Ltd., Thayetmyo.	Natural petroleum	P. L. (renewal)	3,078.4	26th October 1923	1 year.
Do.	(267) Messrs. The Coal-fields of Burma, Ltd., Maymyo.	Natural petroleum and coal	P. L. (renewal)	1,821	7th February 1924.	License extended till M. L. is granted.
Do.	(268) Messrs. The Indo-Burma Oil-fields, Ltd.	Natural petroleum	P. L. (renewal)	2,240	20th January 1924	1 year.
Do.	(269) Messrs. The Indo-Burma Petroleum Co., Ltd., Rangoon.	Do.	P. L. (renewal).	2,560	29th April 1924.	Do.
Do.	(270) Do.	Do.	P. L. (renewal)	3,200	24th May 1924	License extended till M. L. is granted.
Do.	(271) Messrs. The Burma Oil Co. Ltd.	Do.	P. L. (renewal)	1,760	28th August 1924	1 year.

## CENTRAL PROVINCES.

Balaghat	(272) Messrs. Balakrishna Narayan & Co.	Manganese	M. L.	15	26th March 1924.	27 years 9 months.
Do.	(273) Rai Sahib Chhajuram.	Do.	M. L.	11	6th December 1924.	10 years.
Do.	(274) Do.	Do.	M. L.	13	17th June 1924.	15 years.
Do.	(275) Messrs. Balakrishna Narayan & Co.	Do.	M. L.	31	30th January 1924.	30 years.
Do.	(276) Do.	Do.	M. L.	22	Do	Do.
Do.	(277) Do.	Do.	M. L.	27	6th March 1924.	Do.
Do.	(278) Messrs. B. Fauzdar Brothers	Iron Ore	M. L.	11	3rd April 1924.	Do.
Do.	(279) Rai Sahib Seth Goverdhandass.	Manganese	M. L.	7	29th February 1924.	5 years.
Do.	(280) Mr. Sundarlal Golchha.	Do.	M. L.	2	9th August 1924.	10 years.
Do.	(281) Pandit Kripa Shankar	Do.	M. L.	136	18th October 1924	15 years.

CENTRAL PROVINCES -*contd.*

DISTRICT.	Grantee	Mineral	Nature of grant	Area in acres.	Date of commencement	Term.
Balacbat	(282) Pandit Shankar.	Manganese	M. L.	79	7th August 1924	5 years.
Do.	(283) Rai Chhajuram.	Do.	P. L.	40	26th January 1924	1 year.
Do.	(284) Mr. Syed Minhasuddin Ahmed.	Do.	P. L.	6	10th May 1924	Do.
Do.	(285) Seth Satupchand	Do.	P. L.	207	29th February 1924	Do.
Do.	(286) Do.	Do.	P. L.	9	5th June 1924	Do.
Do.	(287) Seth Shreeeram	Do.	P. L.	383	26th February 1924	Do.
Do.	(288) Seth Kooher Chormal	Do.	P. L.	68	26th January 1924	Do.
Do.	(289) Pandit Shankar	Do.	P. L.	19	Do	Do.
Do.	(290) Do	Do.	P. L.	241	7th November 1924	Do.
Do.	(291) Do	Do.	P. L.	56	6th November 1924	Do.
Do.	(292) Do	Do.	P. L.	39	19th March 1924	Do.
Do.	(293) Do	Do.	P. L.	195	9th February 1924	Do.
Do.	(294) Seth Shreeeram	Do.	P. L.	22	26th February 1924	Do.
Do.	(295) Mr. Muhammad Gulam	Do.	P. L.	14	11th July 1924	Do.
Do.	(296) Rai Sahab A. P. Bhargawa	Do.	P. L.	1,029	26th February 1924	Do.
Do.	(297) Seth Katindan Chormal	Do.	P. L.	1	17th March 1924	Do.
Do.	(298) Mr. Muhammad Gulam	Do.	P. L.	42	15th July 1924	Do.
Do.	(299) Do	Do.	P. L.	16	21st June 1924	Do.
Do.	(300) Pandit Shankar	Do.	P. L.	40	26th January 1924	Do.
Do.	(301) Messrs. Vadulal Bhadulal.	Do.	P. L.	98	Do.	Do.
Do.	(302) Mr. Stanley Harris.	Do.	P. L. (renewal)	100	10th November 1924	6 months
Do.	(303) Mr. Noot Muhammad Mitha.	Do.	P. L.	124	10th September 1924	1 year.
Do.	(304) Mr. Narahji Samji	Do.	P. L.	180	26th January 1924	Do.

P. L. = Prospecting License. M. L. = Mining Lease.

CENTRAL PROVINCES -*contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Balaghat .	(305) Mr. Samji Narainji.	Manganese .	P. L. .	176	26th January 1924.	1 year.
Do. .	(306) Do. .	Do. .	P. L. .	102	Do. .	Do.
Do. .	(307) Mr. P. N. Oke .	Do. .	P. L. .	2	28th February 1924.	Do.
Do. .	(308) Messrs. B. N. Soparkar & Co.	Do. .	P. L. .	337	12th May 1924.	Do.
Do. .	(309) Mr. P. N. Oke .	Do. .	P. L. .	20	28th February 1924	Do.
Do. .	(310) Messrs. B. N. Soparkar & Co.	Do. .	P. L. .	299	9th February 1924.	Do.
Do. .	(311) Mr. Chandanlal	Do. .	P. L. .	592	17th March 1924.	Do.
Do. .	(312) Do. .	Do. .	P. L. .	277	Do. .	Do.
Do. .	(313) Messrs. Champalal & Co.	Do. .	P. L. .	122	26th January 1924.	Do.
Do. .	(314) Do. .	Do. .	P. L. .	136	27th August 1924.	Do.
Do. .	(315) Rai Sahib Seth Gowardhandass.	Do. .	P. L. .	3	26th January 1924.	Do.
Do. .	(316) Pandit Rewashankar.	Do. .	P. L. .	455	8th October 1924	Do.
Do. .	(317) Messrs. Khoja Metha Bai Nathoo.	Do. .	P. L. .	123	25th April 1924.	Do.
Do. .	(318) Seth Laxmi Narain Hardeo.	Do. .	P. L. .	122	3rd May 1924	Do.
Do. .	(319) Messrs. Khoja Metha Bhai.	Do. .	P. L. .	39	20th April 1924.	Do.
Do. .	(320) Messrs. Byramji & Co.	Do. .	P. L. .	1,381	21st June 1924.	Do.
Do. .	(321) Mr. P. N. Oke .	Do. .	P. L. .	1	28th February 1924.	Do.
Do. .	(322) Do. .	Do. .	P. L. .	4	Do. .	Do.
Do. .	(323) Central India Mining Company, Limited.	Do. .	P. L. .	162	7th April 1924.	Do.
Do. .	(324) Rai Sahib Seth Gowardhandass.	Do. .	P. L. .	35	6th November 1924.	Do.
Do. .	(325) Mr. P. N. Oke .	Do. .	P. L. .	10	7th April 1924.	Do.
Do. .	(326) Do. .	Do. .	P. L. .	17	9th June 1924.	Do.
Do. .	(327) Mr. Sundarlal Golchha.	Do. .	P. L. .	33	29th February 1924.	Do.
Do. .	(328) Mr. Noor Mohammad Mitha.	Do. .	P. L. .	8	12th September 1924.	Do.

CENTRAL PROVINCES *contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Balaghat .	(329) Mr. Noor Mohammad Mitha.	Manganese .	P. L. .	2	12th September 1924.	1 year.
Do. .	(330) Seth Laxminarayana Hardeo.	Do. .	P. L. .	58	12th July 1924.	Do.
Do. .	(331) Mr. C. Stanley Harris.	Do. .	P. L. .	68	4th November 1924.	Do.
Do. .	(332) Do. .	Do. .	P. L. .	30	Do. .	Do.
Do. .	(333) Mr. Bhulhar Sao.	Do. .	P. L. .	219	20th April 1924.	Do.
Do. .	(334) Rai Sahib Seth Gowardhandass.	Do. .	P. L. .	38	29th February 1924.	Do.
Do. .	(335) Mr. G. E. Muller	Do. .	P. L. .	194	Do. .	Do.
Do. .	(336) Do. .	Do. .	P. L. .	175	17th March 1924.	Do.
Do. .	(337) Seth Shreeram .	Do. .	P. L. .	2	10th June 1924.	Do.
Do. .	(338) Seth Sarupchand.	Do. .	P. L. .	519	1st October 1924.	Do.
Do. .	(339) Mr. Shamji Natamji.	Do. .	P. L. .	54	3rd July 1924	Do.
Do. .	(340) Do. .	Do. .	P. L. .	88	Do. .	Do.
Do. .	(341) Pandit Kripashankar.	Do. .	P. L. .	36	4th October 1924.	Do.
Do. .	(342) Seth Bindhai Sao.	Do. .	P. L. .	36	27th June 1924.	Do.
Do. .	(343) Seth Jagannath	Do. .	P. L. .	107	23rd April 1924.	Do.
Do. .	(344) Seth Bhulhar Sao.	Do. .	P. L. .	80	26th June 1924.	Do.
Do. .	(345) Seth Laxmi Karam Hardeo.	Do. .	P. L. .	5	3rd May 1924	Do.
Do. .	(346) Mr. M. A. Razak	Do. .	P. L. .	60	17th March 1924.	Do.
Do. .	(347) Mr. Sunderlal Golcha.	Do. .	P. L. .	88	10th August 1924.	Do.
Do. .	(348) Pandit Kripashankar.	Do. .	P. L. .	351	20th October 1924.	Do.
Do. .	(349) Mr. Shamji Narainji.	Do. .	P. L. .	102	30th May 1924.	Do.
Do. .	(350) Seth Balbhadra Sao.	Do. .	P. L. .	93	3rd May 1924	Do.
Do. .	(351) N. B. Chopra .	Do. .	P. L. .	31	Do. .	Do.
Do. .	(352) Pandit Rewashankar.	Do. .	P. L. .	123	6th August 1924.	Do.
Do. .	(353) Do. .	Do. .	P. L. .	105	3rd May 1924	Do.

CENTRAL PROVINCES *contd.*

DISTRICT.	Grantee	Mineral.	Nature of grant	Area in acres.	Date of commencement	Term.
Balaghat	(354) Seth Bindai Sao.	Manganese	P. L.	237	26th June 1924.	1 year.
Do.	(355) Pandit Kripa-shankar.	Do.	P. L.	131	9th August 1924.	Do.
Do.	(356) Seth Chogmal Kocher	Do.	P. L.	2	5th June 1924	Do.
Do.	(357) Seth Balbhadra Sao.	Do.	P. L.	82	13th May 1924.	Do.
Do.	(358) Mr. P. N. Oke	Do.	P. L.	22	18th November 1924	Do.
Do.	(359) Seth Balbhadra Sao	Do.	P. L.	4	13th May 1924	Do.
Do.	(360) Messrs. Champalal & Co.	Do.	P. L.	31	20th September 1924	Do.
Do.	(361) Mr. C. S. Harris	Do.	P. L.	115	25th August 1924	Do.
Do.	(362) Do.	Do.	P. L.	57	Do.	Do.
Do.	(363) Mr. Sundaraj Golech	Do.	P. L.	58	27th August 1924	Do.
Do.	(364) Bakaram Singh	Do.	P. L.	514	13th September 1924.	Do.
Do.	(365) Mr. Shamji Narajji	Do.	P. L.	28	19th November 1924.	Do.
Do.	(366) Rai Sahib Mathura Prasad.	Do.	P. L.	167	15th September 1924.	Do.
Do.	(367) Mr. Shamji Narajji.	Do.	P. L.	268	25th November 1924	Do.
Do.	(368) Messrs. Champalal & Co.	Do.	P. L.	497	24th September 1924	Do.
Do.	(369) Do.	Do.	P. L.	52	6th August 1924.	Do.
Do.	(370) Do.	Do.	P. L.	270	20th September 1924.	Do.
Do.	(371) Mr. Abdul Rahim Khan	Do.	P. L.	106	12th April 1924.	Do.
Do.	(372) Do.	Do.	P. L.	31	19th August 1924.	Do.
Do.	(373) Mr. Erachshah	Do.	P. L.	7	16th August 1924	Do.
Do.	(374) Do.	Do.	P. L.	2	3rd May 1924	Do.
Do.	(375) Do.	Do.	P. L.	24	Do.	Do.
Do.	(376) Mr. N. D. Zai & Brothers.	Do.	P. L.	2	26th November 1924.	Do.
Do.	(377) Rai Sahib Seth Gowardhandass	Do.	P. L.	7	10th July 1924.	Do.

CENTRAL PROVINCES—*contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Balaghat	(378) Mr. M. A. Razak	Manganese	P. L.	127	15th December 1924.	1 year.
Do.	(379) Seth Shreeam	Do.	P. L.	56	23rd June 1924.	Do.
Do.	(381) Mr. Gachshah	Do.	P. L.	11	23rd July 1924	Do.
Do.	(381) Mr. A. Pasha, Minor Guardian Muzshi S. Allmoud-die	Do.	M. L.	11	21st October 1924.	20 years.
Do.	(382) Do.	Do.	M. L.	60	Do.	Do.
Do.	(383) Pandit Kripashankar	Do.	M. L.	48	13th November 1924.	15 years.
Do.	(384) Seth Balbhadra Sao.	Do.	P. L.	670	4th October 1924.	1 year.
Do.	(385) Mr. Sunderlal Golcha	Do.	M. L.	33	9th August 1924.	5 years.
Do.	(386) Mr. P. N. Oke	Do.	P. L.	271	24th September 1924.	1 year.
Do.	(387) Mr. G. E. Muller	Do.	P. L.	94	5th June 1924	Do.
Do.	(388) Messrs. N. D. Zal & Brothers	Do.	P. L.	118	26th November 1924.	Do.
Do.	(389) Mr. G. E. Muller	Do.	P. L.	19	2d May 1924	Do.
Do.	(390) Messrs. M. B. Chopra	Do.	P. L.	155	15th December 1924.	Do.
Do.	(391) Mr. P. N. Oke	Do.	P. L.	209	24th September 1924.	Do.
Do.	(392) Mr. Abdur Rahim Khan	Do.	P. L.	15	30th October 1924.	Do.
Do.	(393) Seth Shreeam	Do.	P. L.	21	10th May 1924.	Do.
Do.	(394) Seth Laxminarayan Hatdeo	Do.	P. L.	41	15th December 1924.	Do.
Do.	(395) Abdur Rahim Khan.	Do.	P. L.	13	19th August 1924.	Do.
Do.	(396) Seth Pratap Laxmi Narayan.	Do.	P. L.	185	9th June 1924	Do.
Do.	(397) S. Vinayak Rao	Do.	P. L.	45	26th June 1924	Do.
Do.	(398) Mr. Abdur Rahim Khan.	Do.	P. L.	10	23rd June 1924.	Do.
Do.	(399) Do.	Do.	P. L.	6	21st June 1924.	Do.
Do.	(400) Seth Pratap Laxminarayan	Do.	P. L.	168	3rd September 1924.	Do.
Do.	(401) Chandanlal	Do.	P. L.	280	20th October 1924.	Do.

CENTRAL PROVINCES—*contd.*

DISTRICT	Grantee.	Mineral.	Nature of grant.	Area in acres	Date of commencement	Term.
Balaghat	(402) Mr. P. N. Oke	Manganese	P. L.	357	6th October 1924.	1 year.
Do.	(403) Seth Bhudar Sao	Do.	P. L.	333	10th November 1924.	Do.
Do.	(404) Mr. P. N. Oke	Do.	P. L.	16	3rd September 1924	Do.
Do.	(405) Do.	Do.	P. L.	63	2nd October 1924.	Do.
Do.	(406) S. Venayak Rao	Do.	P. L.	216	26th August 1924.	Do.
Do.	(407) G. C. Muller	Do.	P. L.	97	9th August 1924.	Do.
Do.	(408) Messrs. Martin & Co.	Do.	P. L.	361	6th September 1924.	Do.
Do.	(409) Do.	Do.	P. L.	282	Do.	Do.
Do.	(410) Wasudeo Shrawanjli.	Do.	P. L.	175	20th October 1924.	Do.
Do.	(411) Bhudar Sao	Do.	P. L.	238	1st November 1924.	Do.
Do.	(412) Mr. P. N. Oke	Do.	P. L.	16	6th October 1924.	Do.
Do.	(413) Seth Balbhadra Sao.	Do.	P. L.	26	Do.	Do.
Do.	(414) Mr. P. N. Oke	Do.	P. L.	89	10th December 1924.	Do.
Do.	(415) B. P. Byramji & Co.	Do.	M. L.	115	20th October 1924.	5 years.
Do.	(416) Tata Iron & Steel Co., Ltd.	Do.	P. L.	15	10th December 1924.	1 year.
Do.	(417) Ravi Shankar Shukla.	Do.	P. L.	21	4th November 1924.	Do.
Do.	(418) Do.	Do.	P. L.	432	5th November 1924.	Do.
Do.	(419) Messrs. Wasudeo Shrawanjli.	Do.	P. L.	16	18th November 1924.	Do.
Do.	(420) Do.	Do.	P. L.	1	Do.	Do.
Do.	(421) Do.	Do.	P. L.	7	Do.	Do.
Do.	(422) Do.	Do.	P. L.	32	Do.	Do.
Do.	(423) B. P. Byramji & Co.	Do.	M. L.	20	2nd August 1924.	5 year.
Do.	(424) Do.	Do.	M. L.	4	4th December 1924.	Do.
Do.	(425) Do.	Do.	M. L.	4	2nd August 1924.	Do.

CENTRAL PROVINCES *contd.*

DISTRICT	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Balaghat	(426) B. P. Byramji & Co.	Manganese	M. L.	11	5th December 1924.	5 years.
Do.	(427) Do.	Do.	M. L.	13	2nd August 1924.	Do.
Do.	(428) Do.	Do.	M. L.	3	4th December 1924.	Do.
Do.	(429) Do.	Do.	M. L.	15	2nd August 1924.	Do.
Do.	(430) Do.	Do.	M. L.	26	4th December 1924.	Do.
Do.	(431) Do.	Do.	M. L.	25	2nd August 1924.	Do.
Do.	(432) Do.	Do.	M. L.	22	5th December 1924.	Do.
Do.	(433) Do.	Do.	M. L.	12	2nd August 1924.	Do.
Do.	(434) Ratanchand Keshrichand.	Do.	P. L.	75	18th December 1924.	1 year.
Do.	(435) Mr. Erachshah.	Do.	P. L.	7	26th September 1924.	Do.
Do.	(436) Mr. W. H. Wilkins.	Do.	P. L.	125	8th December 1924.	Do.
Do.	(437) Seth Ganeshlal Ramchand.	Do.	P. L.	14	Do.	Do.
Do.	(438) Do.	Do.	P. L.	7	17th December 1924.	Do.
Do.	(439) Mr. Erachshah.	Do.	P. L.	1	15th October 1924.	Do.
Do.	(440) Chandanlal.	Do.	P. L.	122	18th November 1924.	Do.
Do.	(441) Do.	Do.	P. L.	23	12th November 1924.	Do.
Do.	(442) Seth Mohanlal Berdichand.	Do.	P. L.	41	15th December 1924.	Do.
Do.	(443) Jagannath.	Do.	P. L.	35	10th November 1924.	Do.
Do.	(444) Seth Laxminarayan Hurdeo.	Do.	P. L.	4	15th December 1924.	Do.
Do.	(445) Do.	Do.	P. L.	12	Do.	Do.
Do.	(446) Seth Manakchand Oswal.	Do.	P. L.	83	17th December 1924.	Do.
Do.	(447) B. P. Byramji & Co.	Do.	M. L.	68	2nd October 1924.	5 years.
Do.	(448) Seth Sarupchand	Do.	M. L.	14	27th December 1924.	20 years.



CENTRAL PROVINCES—*contd.*

DISTRICT.	Grantee	Mineral.	Nature of grant.	Area in acres	Date of commencement	Term.
Betul	(149) Mr. R. Bazaz	Coal	M. L.	840	29th February 1924.	30 years.
Do.	(150) Messrs. Bissessar-lal and Jagannath	Do.	M. L.	937	29th January 1924.	Do.
Do.	(151) Mr. Pratul Narain Mukerji.	Do.	M. L.	737	19th March 1924.	Do.
Do.	(152) Mr. Chhedulal Chowdhury.	Do.	P. L.	320	29th March 1924.	1 year.
Do.	(153) Messrs. Abdul Kadir, Abdul Ali & Brothers.	Do.	P. L.	399	29th July 1924.	Do.
Do.	(154) Pandit Kashiram, Contractor.	Do.	P. L.	240	23th November-1921.	Do.
Bhandara	(155) Rai Sahib Seth Gowardhandas.	Manganese	P. L.	7	26th August 1924.	Do.
Do.	(156) Do.	Do.	P. L.	12	10th April 1924.	Do.
Do.	(157) Messrs. Yadulal and Badhlul.	Do.	P. L.	23	17th January 1924.	Do.
Do.	(158) Mr. S. Annud-din.	Do.	P. L.	14	7th January 1924.	Do.
Do.	(159) Mr. S. H. Raquib	Do.	P. L.	80	9th April 1924.	Do.
Do.	(160) Mr. Shukam Seth.	Do.	P. L.	28	27th May 1924.	Do.
Do.	(161) Seth Jagannath	Do.	P. L.	41	3rd August 1924.	Do.
Do.	(162) Rai Sahib Minamal Nandlal	Do.	P. L.	40	22nd August 1924.	Do.
Do.	(163) Mr. Shamji Narainji.	Do.	P. L.	61	23rd July 1924.	Do.
Do.	(164) Messrs. Yadulal Badhlul.	Do.	P. L.	818	19th May 1924.	Do.
Do.	(165) Rai Sahib Seth Gowardhandas.	Do.	P. L.	10	14th May 1924.	Do.
Do.	(166) Seth Jagannath	Do.	P. L.	1	20th September 1924.	Do.
Do.	(167) Mr. Shamji Narainji.	Do.	P. L.	16	23rd July 1924.	Do.
Do.	(168) Rai Sahib Seth Gowardhandas.	Do.	P. L.	123	21st July 1924.	Do.
Do.	(169) Messrs. M. D'Costa and Gourduth Ganeshlal.	Do.	P. L.	204	10th March 1924.	Do.
Do.	(170) Messrs. Munwaralli Turaballi Syndicate.	Do.	P. L.	91	29th July 1924.	Do.
Do.	(171) Mr. Parmesharl-das.	Do.	P. L.	288	10th April 1924.	Do.

CENTRAL PROVINCES—*contd.*

DISTRICT.	Grantor	Mineral	Nature of grant	Area in acres	Date of commencement	Term.
Bhandara	(472) Messrs. M. D'Costa and Gore-dutt Ganeshlal	Manganese	P. L.	76	30th July 1924.	1 year.
Do.	(173) Do	Do	P. L.	63	Do.	Do.
Do	(174) Messrs. Champalal & Co	Do.	P. L.	26	20th September 1924.	Do.
Do.	(175) Messrs. M. D'Costa and Gore-dutt Ganeshlal.	Do.	P. L.	61	30th July 1924.	Do.
Do	(176) Do	Do	P. L.	149	Do.	Do.
Do.	(477) Mr. S. Ramzaya Naglu	Do	P. L.	34	18th August 1924.	Do.
Do	(178) Do	Do	P. L.	174	10th November 1924.	Do
Do	(179) Messrs. Ram-naram and Jagannath	Do.	P. L.	217	5th November 1924	Do
Do	(180) Do.	Do	P. L.	171	Do.	Do
Do	(181) Mr. Shriram Seth	Do	P. L.	159	14th November 1924.	Do
Do	(182) Do.	Do	P. L.	123	Do.	Do.
Do.	(183) Messrs. M. D'Costa and Gore-dutt Ganeshlal	Do.	P. L.	310	26th September 1924.	Do.
Do.	(184) Do.	Do	P. L.	430	Do.	Do.
Do	(185) Messrs. M. D'Costa and Gore-dutt Ganeshlal	Do	P. L.	157	5th December 1924.	Do.
Do.	(186) Messrs. Nilkanto Sao & Co.	Do.	P. L.	26	8th December 1924.	Do.
Do.	(487) Mr P. N. Oke	Do.	P. L.	71	28th November 1923.	Do.
Do	(488) Mr. M. A. Pasha	Do.	M. L.	2	7th February 1924.	10 years.
Do	(489) Messrs. B. P. Byramji & Co.	Do.	M. L.	21	23rd February 1924.	5 years.
Do.	(190) Lala Jainarain Mohanlal.	Do.	M. L.	19	23rd October 1924.	30 years.
Bilaspur	(191) Messrs. Agar-wala Brothers of Bilaspur.	Mica	P. L.	247	15th April 1924	1 year.
Do.	(192) Do	Do.	P. L.	11	26th May 1924.	Do.
Chanda	(193) Sir M. B. Dada-bhai, Bar-at-Law.	Coal	M. L.	591	22nd August 1924.	30 years.
Do.	(194) Rai Salub D Laxmalaram.	Do.	P. L.	810	20th March 1924.	1 year.

P. L. = *Prospecting License.*M. L. = *Mining Lease.*

CENTRAL PROVINCES—*contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Chhindwara	(495) Lala Mohandal, Jainaram Contractors.	Manganese .	P. L. .	43	23rd January 1921.	1 year.
Do.	(496) Rai Mathura Prasad Motilal & Company	Do.	P. L. .	150	30th July 1921.	Do.
Do.	(497) Noor Moham-mad Mitha.	Do.	P. L. .	81	5th February 1921.	Do.
Do.	(498) Rai Mathura Prasad Motilal & Company.	Do.	P. L. .	111	30th July 1921.	Do.
Do.	(499) Seth Hazratmal	Do.	P. L. .	387	19th February 1924	Do.
Do.	(500) Messrs. Gupta & Sons.	Do.	P. L. .	..	12th April 1921.	Do.
Do.	(501) Do.	Do.	P. L. .	156	Do.	Do.
Do.	(502) Pandit Kedar-nath Bhargava.	Coal . . .	P. L. .	71	30th September 1924.	Do.
Do.	(503) Mr. A. V. Wazal-war.	Manganese .	P. L. .	21	21th April 1921.	Do.
Do.	(504) Khan Sahib M. Husauji.	Coal . . .	P. L. .	96	28th July 1924.	Do.
Do.	(505) Messrs. B. Fauz-der & Brothers.	Manganese .	P. L. .	4	24th April 1921.	Do.
Do.	(506) Mr. Samiulla Khan.	Do.	P. L. .	52	3rd Septem-ber 1924.	Do.
Do.	(507) Do.	Do.	P. L. .	57	17th May 1921.	Do.
Do.	(508) Messrs. B. Fauz-der & Brothers.	Do.	P. L. .	76	24th April 1921.	Do.
Do.	(509) Berar Mining Association.	Do.	P. L. .	97	30th October 1921.	Do.
Do.	(510) Mr. A. V. Wazal-war.	Coal . . .	P. L. .	324	1st October 1921.	Do.
Do.	(511) Mr. Samiulla Khan.	Manganese .	P. L. .	124	2nd July 1924	Do.
Do.	(512) Do.	Do.	P. L. .	188	Do.	Do.
Do.	(513) H. S. Zahiruddin	Coal . . .	P. L. .	110	5th July 1924	Do.
Do.	(514) Mr. F. L. G. Simpson.	All minerals except coal.	P. L. .	548	17th October 1924.	Do.
Do.	(515) Messrs. B. Fauz-der & Brothers.	Manganese .	P. L. .	30	18th October 1924.	Do.
Do.	(516) Mr. Samiulla Khan.	Do.	P. L. .	25	16th August 1924.	Do.
Do.	(517) Do.	Do.	P. L. .	81	23rd October ber 1924.	Do.

CENTRAL PROVINCES—*contd.*

DISRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Chhindwara	(518) Messrs. K. R. Padey and Jurakhani Dubey.	Manganese .	P. L. .	92	30th September 1924.	1 year.
Do.	(519) Mr. Samdulla Khan	Do.	P. L. .	236	3rd September 1924.	Do.
Do.	(520) Mr. Ahmad Ali .	Do.	P. L. .	193	17th December 1924.	Do.
Do.	(521) Mr. Samdulla Khan.	Do.	P. L. .	132	23rd October 1924.	Do.
Do.	(522) Mr. Nour Mahammad Mitha.	Coal .	P. L. .	131	18th November 1924.	Do.
Do.	(523) Do.	Do.	P. L. .	44	8th December 1924.	Do.
Do.	(524) Seth Bansidhai Ramnanna.	Do.	P. L. .	62	25th August 1924.	Do.
Do.	(525) Subedar Mirtyunaji Prasad.	Do.	P. L. .	279	10th September 1924.	Do.
Do.	(526) Do.	Do.	P. L. .	84	Do.	Do.
Do.	(527) Messrs. Maharaj Kishore & Co.	Do.	P. L. .	108	13th December 1924.	Do.
Do.	(528) Lala Jagannath Prasad & Brothers.	Do.	P. L. .	214	19th December 1924.	Do.
Do.	(529) Messrs. K. R. Padey and Jurakhani Dubey.	Manganese .	P. L. .	64	23rd December 1924.	Do.
Do.	(530) Captain Leonard Newton.	Coal .	P. L. .	751	17th December 1924.	Do.
Do.	(531) Mr. R. Bazaaz .	Do.	M. L. .	495	18th December 1924.	30 years.
Do.	(532) Lala Beharilal .	Do.	M. L. .	120	19th February 1924.	Do.
Do.	(533) Shaikh Shahabuddin, Contractor.	Do.	M. L. .	51	28th March 1924.	10 years.
Do.	(534) Seth Hazarimal Bazaaz.	Do.	M. L. .	71	9th February 1924.	30 years.
Do.	(535) Captain Leonard Newton.	Do.	M. L. .	360	13th August 1924.	Do.
Do.	(536) Seth Lakshminchandra, Bictul.	Do.	M. L. .	254	22nd April 1924.	Do.
Do.	(537) Rai Sahib Seth Gowardhan Das.	Do.	M. L. .	119	23rd April 1924.	Do.
Do.	(538) Rai Sahib Minamal and Nandlal.	Do.	M. L. .	147	6th November 1924.	Will expire with the mining lease, dated the 16th September 1922, to which it is supplementary.

CENTRAL PROVINCES—*contd.*

DISTRICT	Grantee	Mineral	Name of grant	Area in acres	Date of commencement.	Term.
Chhindwara	(539) B. Faujdet & Brothers	Manganese	M. L.	28	20th September 1921.	30 years
Do.	(540) Seth Hazarnath Bhatia	Do.	M. L.	23	27th September 1924	10 years.
Do.	(541) Do.	Do.	M. L.	10	Do.	Do.
Do.	(542) Lala Behar Lal	Coal	M. L.	60	9th December 1921	Will expire with the mining lease dated the 19th February 1921, to which it is supplementary
Hoshangabad	(543) Messrs. Abdul Kadir, Abdul Ali & Brothers	Do.	P. L.	248	12th April 1921	1 year.
Jubbulpore.	(544) Messrs. Chhannulal Sheoprasad	Manganese	P. L.	61	8th September 1921	Do.
Do.	(545) Mr. P. C. Dutt	Do.	M. L.	6	25th February 1921.	30 years
Do.	(546) Do.	Do.	P. L.	202	17th September 1921	1 year.
Do.	(547) Fata Electro-Chemicals, Ltd.	Bauxite	P. L.	111	19th January 1921.	Do.
Do.	(548) Mr. P. C. Dutt	Manganese	P. L.	3	10th May 1921	Do.
Do.	(549) Messrs. Gupta & Sons.	Do.	P. L.	38	13th July 1921.	Do.
Do.	(550) Do.	Do.	P. L.	21	Do.	Do.
Do.	(551) Do.	Do.	P. L.	249	Do.	Do.
Do.	(552) Mr. P. C. Dutt	Do.	P. L.	12	16th August 1924.	Do.
Do.	(553) Do.	Do.	P. L.	82	14th October 1924.	Do.
Do.	(554) Mr. Prack Shah	Do.	P. L.	163	23rd August 1921.	Do.
Do.	(555) Messrs. Gupta & Sons.	Do.	P. L.	17	14th September 1924.	Do.
Do.	(556) Do.	Do.	P. L.	20	Do.	Do.
Do.	(557) Mr. P. C. Dutt	Manganese, gold and silver.	P. L.	11	1st October 1924.	Do.
Do.	(558) Messrs. Gupta & Sons.	Manganese	P. L.	11	13th July 1921.	Do.
Do.	(559) Do.	Do.	P. L.	..	Do.	Do.
Do.	(560) Seth Partab Laxmi Narayan.	Do.	P. L.	102	10th September 1924.	Do.

P. L. = Prospecting License. M. L. = Mining Lease.

CENTRAL PROVINCES—*contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Jubbulpore.	(561) Messrs. Gupta & Sons.	Manganese .	P. L.	10	5th December 1924.	1 year.
Do.	(562) Mr. P. C. Dutt .	Do. .	M. L.	12	1st December 1924.	30 years.
Do.	(563) Do.	Do. .	M. L.	25	Do. .	Do.
Do.	(564) Messrs. Vasudeo Sharwanji.	Do. .	P. L.	100	15th December 1924.	1 year.
Do.	(565) Mr. M. B. Marfatia.	Do. .	P. L.	261	10th November 1924.	Do.
Do.	(566) Seth Chhannulal B. Shivaprasad.	Do. .	P. L.	14	8th December 1924.	Do.
Do.	(567) Mr. M. B. Marfatia.	Do. .	P. L.	85	16th December 1924.	Do.
Do.	(568) Messrs. Ganpatrao and Dhanpatrao.	Do. .	P. L.	74	4th December 1924.	Do.
Mandla .	(569) Debi Prasad, Bania of Raipur.	Mica .	P. L.	86	1st March 1924.	Do.
Nagpur .	(570) Messrs. Ramprasad and Laxmi Narayan, Kumptee.	Manganese .	P. L.	146	15th February 1924.	Do.
Do.	(571) Mr. Shamji Narainji, Ramtek.	Do. .	P. L.	76	28th May 1924.	Do.
Do.	(572) The Turaballi and Manwaralli Syndicate, Nagpur.	Do. .	P. L.	106	8th May 1924	Do.
Do.	(573) Mr. Shamji Narainji, Ramtek.	Do. .	P. L.	14	13th February 1924.	Do.
Do.	(574) Messrs. K. R. Paday and Jurakhan Dube, Nagpur.	Do. .	P. L.	185	26th August 1924.	Do.
Do.	(575) Sir M. B. Dadabhoy, Kt., C.I.E., Nagpur.	Do. .	P. L.	6	12th June 1924.	Do.
Do.	(576) Mr. Nur Muhammad Metha, Nagpur.	Do. .	P. L.	96	17th May 1924	Do.
Do.	(577) Seth Laxminarain, Hardeo, Kumptee.	Do. .	P. L.	10	5th February 1924.	Do.
Do.	(578) Do.	Do. .	P. L.	31	15th February 1924.	Do.
Do.	(579) The Turaballi and Manwaralli Syndicate, Nagpur.	Do .	P. L.	48	Do. .	Do.
Do.	(580) Seth Raghunathdas Bharuka, Kumptee.	Do. .	P. L.	222	13th February 1924.	Do.
Do.	(581) Messrs. B. Fozdar & Bros., Nagpur.	Do. .	P. L.	83	1st July 1924	Do.

P. L. = *Prospecting Licence.* M. L. = *Mining Lease.*

CENTRAL PROVINCES - *contd.*

District.	Grant e.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Nagpur .	(542) Mr. Ganpat Rao Laxman Rao, Nagpur.	Manganese .	P. L. .	22	25th February 1924.	1 year.
Do .	(543) The Turaballi and Manwaralli Syndicate, Nagpur.	Do. .	P. L. .	59	15th February 1924.	Do.
Do. .	(544) Mr. Rajnath Doshi.	Do. .	P. L. .	42	1st April 1924	Do.
Do. .	(545) Mr. Mahamaji Narainji, Rautek.	Do. .	P. L. .	38	26th May 1924.	Do.
Do. .	(546) Do. .	Do. .	P. L. .	30	10th May 1924.	Do.
Do. .	(547) Do. .	Do. .	P. L. .	111	28th August 1924.	Do.
Do. .	(548) Do. .	Do. .	P. L. .	187	9th September 1924.	Do.
Do. .	(549) Mr. M. A. Razak, Kamptee.	Do. .	P. L. .	91	6th February 1924.	Do.
Do. .	(590) Do. .	Do. .	P. L. .	14	8th April 1924.	Do.
Do. .	(591) Do. .	Do. .	P. L. .	52	27th March 1924.	Do.
Do. .	(592) Do. .	Do. .	P. L. .	40	Do. .	Do.
Do. .	(593) Seth Meghraj Golcha, Nagpur.	Do. .	P. L. .	31	31st January 1924.	Do.
Do. .	(594) The Turaballi and Manwaralli Syndicate, Nagpur.	Do. .	P. L. .	49	15th February 1924.	Do.
Do. .	(595) The Coal Bunkering and Shipping Co., Ltd., Calcutta.	Do. .	P. L. .	411	31st March 1924.	Do.
Do. .	(596) Seth Laxminarain, Kamptee.	Do. .	P. L. .	40	15th February 1924.	Do.
Do. .	(597) R. S. Ramkrishna Puri, Nagpur.	Do. .	P. L. .	11	17th May 1924.	Do.
Do. .	(598) Seth Meghraj Golcha, Nagpur.	Do. .	P. L. .	144	5th July 1924	Do.
Do. .	(599) The Turaballi and Manwaralli Syndicate, Nagpur.	Do. .	P. L. .	108	5th June 1924	Do.
Do. .	(600) Sir M. B. Dadabhoi, K.T., C.I.E., Nagpur.	Do. .	P. L. .	134	12th June 1924.	Do.
Do. .	(601) Seth Raghunathdas Bharuka, Kamptee.	Do. .	P. L. .	22	13th February, 1924.	Do.

P. L. = Prospecting License.

CENTRAL PROVINCES—*contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Nagpur .	(602) Sir M. B. Dada-bhoy, Kt., C.I.E., Nagpur.	Manganese .	P. L. .	125	11th June 1924.	1 year.
Do. .	(603) Messrs. Rajnath and Dwarkanath, Delhi.	Do. . .	P. L. .	371	1st April 1924	Do.
Do. .	(604) Mr. Shamji Narainji, Ramtek.	Do. .	P. L. .	198	30th August 1924.	Do.
Do. .	(605) The Turaballi and Manwaralli Syndicate, Nagpur.	Do. . .	P. L. .	78	8th May 1924	Do.
Do. .	(606) Lala Jainarain Mohanlal, Nagpur.	Do. . .	P. L. .	157	6th May 1924	Do.
Do. .	(607) Messrs. Rajnath and Dwarkanath, Delhi.	Do. . .	P. L. .	22	22nd October 1924.	Do.
Do. .	(608) Lala Jainarain Mohanlal of Nagpur.	Do. . .	P. L. .	3	12th February 1924.	Do.
Do. .	(609) Sir M. B. Dada-bhoy, Kt., C.I.E., Nagpur.	Do. . .	P. L. .	158	11th June 1924.	Do.
Do. .	(610) Do. .	Do. . .	P. L. .	38	12th June 1924.	Do.
Do. .	(611) Do. .	Do. . .	P. L. .	39	Do. .	Do.
Do. .	(612) Messrs. Rajnath and Dwarkanath, Delhi.	Do. . .	P. L. .	197	1st April 1924	Do.
Do. .	(613) Do. .	Do. . .	P. L. .	98	Do.	Do.
Do. .	(614) Mr. Shamji Narainji, Ramtek.	Do. . .	P. L. .	57	8th September 1924.	Do.
Do. .	(615) Mr. Ganpat Rao Lakiman Rao, Nagpur.	Do. . .	P. L. .	482	11th February 1924	Do.
Do. .	(616) Shriram Seth, Tumsar.	Do. . .	P. L. .	14	31st July 1924	Do.
Do. .	(617) Seth Laxminarasu, Kamptee.	Do. . .	P. L. .	50	16th April 1924.	Do.
Do. .	(618) Sir M. B. Dada-bhoy, Kt., C.I.E., Nagpur.	Do. . .	P. L. .	286	12th June 1924.	Do.
Do. .	(619) The Coal Bunkering and Shipping Co., Calcutta.	Do. . .	P. L. .	215	19th September 1924.	Do.
Do. .	(620) Messrs. N. D. Zal & Bros., Kamptee.	Do. . .	P. L. .	50	15th July 1924.	Do.
Do. .	(621) Seth Raghubathdas Bharnka, Kamptee.	Do. . .	P. L. .	29	9th May 1924	Do.

P. L. = Prospecting Licence.



CENTRAL PROVINCES—*contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Nagpur.	(622) Seth Lurn Narain Hardeo, Kamptee.	Manganese.	P. L.	10	10th April 1921.	1 year
Do.	(623) The Turaballi and Manwaralli Syndicate, Kamptee.	Do.	P. L.	392	9th July 1924	Do.
Do.	(624) Messrs. M. D' Costa and Goro Dutt, Nagpur.	Do.	P. L.	33	11th February 1924.	Do
Do.	(625) Messrs. Harraam and Maniran.	Do.	P. L.	63	9th July 1921	Do
Do.	(626) Messrs. Rajnath and Dwarkanath, Delhi.	Do.	P. L.	182	6th June 1924	Do.
Do.	(627) Seth Meghraj Golcha, Nagpur.	Do.	P. L.	101	5th July 1924	Do.
Do.	(628) Lala Jainarain, Nagpur.	Do.	P. L.	631	1st July 1924	Do.
Do.	(629) Mr. Shamji Narainji, Ramtek.	Do.	P. L.	83	30th August 1924.	Do.
Do.	(630) Do.	Do.	P. L.	20	28th August 1924.	Do.
Do.	(631) Mr. M. A. Razak, Kamptee.	Do.	P. L.	80	18th November 1924.	Do.
Do.	(632) Mr. Erachshah, Pleader, Kamptee.	Do.	P. L.	20	5th June 1924	Do.
Do.	(633) Sir M. B. Dadabhoy, Kt., C.I.E., Nagpur.	Do.	P. L.	66	1st July 1924	Do.
Do.	(634) Seth Shrikisan Hazarimal, Kamptee.	Do.	P. L.	27	17th April 1924.	Do.
Do.	(635) Seth Laxminarain Hardeo, Kamptee.	Do.	P. L.	20	13th June 1921.	Do.
Do.	(636) Messrs. Gupta & Sons, Nagpur.	Do.	P. L.	51	27th June 1924.	Do.
Do.	(637) Mr. Erachshah, Pleader, Kamptee.	Do.	P. L.	107	18th June 1924.	Do.
Do.	(638) The Coal Bunkering and Shipping Company, Calcutta.	Do.	P. L.	25	31st March 1924.	Do.
Do.	(639) Do.	Do.	P. L.	157	19th September 1924.	Do.
Do.	(640) Do.	Do.	P. L.	201	Do.	Do.
Do.	(641) Messrs. Gupta & Sona, Nagpur.	Do.	P. L.	74	1st July 1924	Do.
Do.	(642) Syed Hafizul Raquib, Wargaoon.	Do.	P. L.	06	9th May 1924	Do.

CENTRAL PROVINCES—*contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Nagpur	(643) Messrs. Rajnath and Dwarkanath, Delhi.	Manganese	P. L.	42	22nd October 1924.	1 year.
Do.	(644) Messrs. Gupta & Sons, Nagpur.	Do	P. L.	222	1st July 1924	Do.
Do.	(645) Mr. Shamji Naranji, Ramtek.	Do.	P. L.	87	6th September 1924.	Do.
Do.	(646) Mr. M. A. Razak, Kamptee.	Do	P. L.	7	1st July 1924	Do
Do.	(647) Messrs. Gupta & Sons, Nagpur.	Do.	P. L.	106	9th October 1924.	Do
Do.	(648) Sir M. B. Dada bhoj, Kt., C.I.E.	Do	P. L.	597	21st August 1924.	Do.
Do.	(649) Khan Salih M Hasanji, Nagpur.	Do.	P. L.	840	13th March 1924.	Do.
Do.	(650) Messrs. N. D. Zal & Bros., Kamptee.	Do.	P. L.	13	24th September 1924	Do.
Do.	(651) Khan Salih M. Hasanji, Nagpur.	Do.	P. L.	98	21st October 1924.	Do.
Do.	(652) Rati Sahib Seth (Gowardhanji), Tumkur.	Do.	P. L.	419	5th June 1924	Do.
Do.	(653) Do.	Do.	P. L.	32	5th July 1924	Do.
Do.	(654) Do.	Do.	P. L.	171	5th June 1924	Do.
Do.	(655) The Turaballi and Manwaralli Syndicate, Nagpur.	Do.	P. L.	33	8th November 1924.	Do.
Do.	(656) Mr. Shamji Naranji.	Do.	P. L.	54	10th May 1924.	Do.
Do.	(657) Seth Raghunathdas, Bhanuka.	Do	P. L.	41	1st November 1924.	Do.
Do.	(658) Messrs. M. D'Costa and Gore Dutt, Nagpur.	Do.	P. L.	45	2nd September 1924.	Do
Do.	(659) Messrs. Ram Krishna Ramnath, Kamptee.	Do.	P. L.	280	11th July 1924.	Do.
Do.	(660) Messrs. Abdul Rahim Khan, Balaghat.	Do.	P. L.	355	16th September 1924.	Do.
Do.	(661) Seth Mangalchand Premchand, Nagpur.	Do.	P. L.	78	26th November 1924.	Do.
Do.	(662) Mr. Brachshah, Pleader, Kamptee.	Do.	P. L.	110	26th August 1924.	Do.
Do.	(663) The Turaballi and Manwaralli Syndicate, Nagpur.	Do.	P. L.	234	20th October 1924.	Do.

CENTRAL PROVINCES—*contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Nagpur	(654) The Turaballi and Matiwatali Syndicate, Nagpur	Manganese	P. L.	99	1st December 1921.	1 year.
Do.	(665) R a l S a h i b Seth Gwardlandas, Tumana.	Do.	P. L.	235	13th December 1921.	Do.
Do.	(666) Mr. Abdul Rahim, Pleader, Balaghat.	Do.	P. L.	390	28th August 1921.	Do.
Do.	(667) Saiyed Hifzul Raquili, Waigao.	Do.	P. L.	123	27th August 1921.	Do.
Do.	(668) Messrs. Ganpatrao Dhanpatrao, Andhergaon.	Do.	P. L.	37	9th August 1924.	Do.
Do.	(669) Mr. S. Vinalk Rao, Nagpur.	Do.	P. L.	78	5th July 1921	Do.
Do.	(670) Seth Mangalchand Promchand, Nagpur.	Do.	P. L.	141	18th September 1921.	Do.
Do.	(671) Mr. S. Vinalk Rao, Nagpur.	Do.	P. L.	28	13th December 1921.	Do.
Do.	(672) Do.	Do.	P. L.	531	11th June 1924.	Do.
Do.	(673) Seth Gopaldas Nemichand, Kamptee.	Do.	P. L.	599	18th June 1924.	Do.
Do.	(674) Seth Itaghnathdas Bharuka, Kamptee.	Do.	P. L.	59	15th November 1924.	Do.
Do.	(675) Mr. S. Aminudm, Nagpur.	Do.	P. L.	40	19th June 1924.	Do.
Do.	(676) Seth Gopaldas Nemichand, Kamptee.	Do.	P. L.	128	2nd August 1921.	Do.
Do.	(677) Messrs. Hari-ram Manrao, Hewra.	Do.	P. L.	978	25th October 1921.	Do.
Do.	(678) Mr. Abdul Ali, Hinganghat.	Do.	P. L.	8	11th December 1924.	Do.
Do.	(679) Messrs. Ganpatrao, Dhanpatrao, Andhergaon.	Do.	P. L.	162	25th October 1924.	Do.
Do.	(680) Saiyed Hifzul Raquili, Waigao.	Do.	P. L.	183	8th December 1921.	Do.
Do.	(681) Seth Gopaldas Nemichand, Kamptee.	Do.	P. L.	25	26th September 1924.	Do.
Do.	(682) Mr. Nur Mahammad Mitha, Nagpur.	Do.	P. L.	187	11th December 1921.	Do.
Do.	(683) Saiyed Hifzul Raquili, Waigao.	Do.	P. L.	111	10th October 1924.	Do.

CENTRAL PROVINCES—*contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Nagpur	(684) Messrs. Abdul Hussain Mulla Allabuxji and J. E. Bullimore, Nagpur.	Yangauese	P. L.	127	26th December 1924.	1 year.
Do.	(685) Mr. Nur Mahammad Meltha, Nagpur.	Do.	P. L.	119	22nd September 1924.	Do.
Do.	(686) Shaikh Kasam, Nagpur.	Do.	P. L.	105	24th November 1921.	Do.
Do.	(687) Do.	Do.	P. L.	232	11th November 1924.	Do.
Do.	(688) Do.	Do.	P. L.	187	8th November 1924.	Do.
Do.	(689) Messrs. B. Fouzdar & Brothets, Nagpur.	Do.	P. L.	144	12th December 1924.	Do.
Do.	(690) Mr. Erachshah, Pleader, Kamptee.	Do.	P. L.	72	8th December 1921.	Do.
Do.	(691) Mr. S. Ymaik Rao, Nagpur.	Do.	P. L.	63	25th September 1924.	Do.
Do.	(692) Messrs. Ramkrishna Ramnath, Kamptee.	Do.	P. L.	66	13th December 1924.	Do.
Do.	(693) Messrs. Gupta & Sons, Nagpur.	Do.	P. L.	35	6th December 1924.	Do.
Do.	(694) Messrs. B. Fouzdar & Bros., Nagpur.	Do.	M. L.	25	27th September 1924.	30 years.
Do.	(695) Seth Gopaldas Nemichand, Kamptee.	Do.	P. L.	41	9th October 1921.	1 year.
Do.	(696) Mr. M. A. Razak, Pleader, Nagpur.	Do.	P. L.	33	21st October 1924.	Do.
Do.	(697) Khan Sahib M. Hassanji, Nagpur.	Do.	P. L.	81	Do.	Do.
Do.	(698) The Tunalali and Manwaralli Syndicate, Nagpur.	Do.	P. L.	119	1st December 1924.	Do.
Do.	(699) Shrifram Seth of Tumsar.	Do.	P. L.	349	31st July 1924.	Do.
Do.	(700) Messrs. K. R. Paday and Jirakhan Dube, Nagpur.	Do.	P. L.	40	8th December 1924.	Do.
Do.	(701) Mr. Maheshpuri, Nagpur.	Do.	P. L.	43	11th December 1924.	Do.
Do.	(702) Do.	Do.	P. L.	13	20th November 1924.	Do.
Do.	(703) Mr. Abdul Rahim Khan, Pleader, Balaghat.	Do.	P. L.	304	16th October 1924.	Do.

P. L. = *Prospecting License.*M. L. = *Mining Lease.*

CENTRAL PROVINCES—*contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres	Date of commencement.	Term.
Nagpur .	(704) Syed Hefzul Raquib of Waigaon.	Manganese .	P. L. .	111	10th October 1924	1 year.
Do. .	(705) The Nagpur Manganese Mining Syndicate, Nagpur.	Do. . .	M. L. .	39	24th April 1921.	10 years.
Do. .	(706) The Central India Mining Company, Kamptee.	Do. . .	M. L. .	3	13th May 1921.	10 years, 4 months and 28 days.
Do. .	(707) The Central Provinces Manganese Ore Co., Nagpur.	Do. . .	M. L. .	1	28th June 1921.	Do.
Do. .	(708) Mr. Shamji Narainji, Ramtek.	Do. . .	M. L. .	70	28th April 1924	15 years.
Do. .	(709) Rai Sahib Ramkrishna Puri, Nagpur.	Do. . .	M. L. .	52	8th February 1921.	5 years.
Do. .	(710) Mr. Shamji Narainji, Ramtek.	Do. . .	M. L. .	7	30th January 1921.	15 years.
Do. .	(711) Seth Bansidhar Ramniwas, Nagpur.	Do. . .	M. L. .	23	Do	5 years.
Do. .	(712) Rai Sahib Ramkrishna Puri, Nagpur.	Do. . .	M. L. .	26	8th February 1921.	Do.
Do. .	(713) Seth Bansidhar Ramniwas, Nagpur.	Do. . .	M. L. .	12	30th January 1921.	Do.
Do. .	(714) Rai Sahib Ramkrishna Puri, Nagpur.	Do. . .	M. L. .	32	8th February 1921.	Do.
Do. .	(715) Goswami Mahesh Puri, Nagpur.	Do. . .	M. L. .	68	21st November 1921.	10 years.
Do. .	(716) The Central India Mining Co., Kamptee.	Do. . .	M. L. .	1	10th September 1924.	16 years, 1 month and 3 days.
Do. .	(717) Mr. Ganpat Rao Laxman Rao, Nagpur.	Do. . .	M. L. .	14	20th March 1924.	5 years.
Do. .	(718) The Turaballi and Manwaralli Syndicate, Nagpur.	Do. . .	M. L. .	27	14th February 1924.	30 years.
Do. .	(719) Mr. A. E. Tinch, Kamptee.	Do. . .	M. L. .	19	28th February 1924.	1 year.
Do. .	(720) The Nagpur Manganese Mining Syndicate, Nagpur.	Do. . .	M. L. .	44	1st April 1924	15 years.
Do. .	(721) The Central India Mining Co., Kamptee.	Do. . .	M. L. .	26	13th May 1921.	5 years.
Do. .	(722) Mr. Raghunathdas Bharuka, Kamptee.	Do. . .	M. L. .	68	28th April 1924.	30 years.

P. L. = *Prospecting License.*M. L. = *Mining Lease,*

CENTRAL PROVINCES—*concl'd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Nagpur .	(723) The Central India Mining Co., Kamptee.	Manganese .	M. L. .	13	2nd June 1924.	30 years.
Do. .	(724) Seth Raghunathdas Bharkuka, Kamptee.	Do. .	M. L. .	6	23rd July 1924.	10 years.
Do. .	(725) Seth Bansidhar Ramniwas, Nagpur.	Do. .	M. L. .	66	10th September 1924.	30 years.
Do. .	(726) Seth Meghraj Golcha, Nagpur.	Do. .	M. L. .	31	17th October 1924.	Do.
Do. .	(727) The Nagpur Manganese Mining Syndicate, Nagpur.	Do. .	M. L. .	1	31st October 1924.	11 years, 7 months.
Seoni .	(728) Rai Sahib A. P. Bhargava.	Do. .	P. L. .	367	7th January 1924.	1 year.
Do. .	(729) Do. .	Do. .	P. L. .	72	3rd May 1924	Do.
Do. .	(730) Do. .	Do. .	P. L. .	78	Do. .	Do.

## MADRAS.

Anantapur .	(781) J. G. Virean, Esq., Agent, North Anantapur Gold Fields.	Gold .	P. L. .	1,789 00	21st July 1924.	1 year.
Belbary .	(732) Messrs. Gurseljee and Muncharjee's Sons of Bombay.	Hematite .	M. L. .	1,298 88	15th February 1924.	30 years.
Do. .	(733) Do. .	Do. .	M. L. .	853 51	..	..
Do. .	(734) Messrs. Doddanna Gowd and Venupaksha Gowd.	Red earth .	P. L. .	85 00	12th March 1921.	1 year.
Do. .	(735) Mr. K. Abdul Hy.	Manganese .	P. L. .	1,503 16	8th April 1924	Do.
Do. .	(736) Mr. K. Ramchandra.	Do.	P. L. .	108 27	3rd September 1924.	Do.
Do. .	(737) M. R. Ry. A. Pitchaiya Nayudu.	Do. .	P. L. .	360	4th August 1924.	Do.
Cuddapah .	(738) K. Venkatesayya.	Barytes .	P. L. .	39 65	18th January 1921.	Do.
Do. .	(739) Mysore Development Syndicate.	Asbestos .	P. L. .	538 93	18th December 1924.	Do.
Do. .	(740) Do. .	Do. .	P. L. .	463 46	Do. .	Do.
Kurnool .	(741) M. R. Ry. B. P. Seshareddi of Bethamcherla.	Barytes .	P. L. .	4 32	12th June 1924	Do.
Do. .	(742) Do. .	Do. .	P. L. .	5 87	Do. .	Do.

P. L.—*Prospecting License.*  
M. L.—*Mining Lease.*

## MADRAS—concl'd.

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Kurnool .	(713) M. R. Ry. B. P. Seshareddi of Hethamcherla.	Barytes . .	P. L. .	14.40	12th June 1924	1 year.
Do. .	(744) Do. .	Do. . .	P. L. .	11.05	Do. .	Do.
Do. .	(745) Do. .	Do. . .	P. L. .	7.94	14th January 1924.	Do.
Do. .	(746) Do. .	Do. . .	P. L. .	18.03	12th June 1924.	Do.
Do. .	(747) Do. .	Do. . .	P. L. .	6.62	Do. .	Do.
Nellore .	(748) M. R. Ry. V. Venkatasubbayya Nayudu.	Mica . . .	M. L. .	23.85	10th January 1924.	30 years.
Do. .	(719) M. R. Ry. Iska Garatya of Manipur.	Do. . .	M. L. .	10.51	9th January 1921.	Do.
Do. .	(750) Messrs Tellabodu & Co., Ltd., Madras	Do. . .	M. L. .	0.30	9th August 1921.	Do.
Do. .	(751) M. R. Ry. G. C. Subba Reddi of Battulapali.	Do. . .	M. L. .	37.51	3rd September 1924.	Do.
Do. .	(752) M. R. Ry. P. Viraswaha Reddi of Kofa.	Do. . .	M. L. .	3.09	10th July 1924.	Do.
Do. .	(753) M. R. Ry. V. Venkatasubba yya Nayudu of Gudur.	Do. . .	P. L. .	6.52	4th March 1924.	1 year.
Do. .	(754) M. R. Ry. G. C. Subba Reddi of Battulapali.	Do. . .	P. L. .	2.86	26th July 1924.	Do.
Do. .	(755) M. R. Ry. Sri Raja Sita Ramchandra Sri Ranga Bhupalla Bhalla Rao of Pedda Pavani.	Do. . .	M. L. .	71.77	17th October 1924.	30 years.
Nilgiri .	(756) Mr. A. K. Goston	Do. . .	M. L. .	46.00	16th January 1924.	Do.
Do. .	(757) Do. .	Do. . .	P. L. .	345.96	16th May 1924.	1 year.
Do. .	(758) Mr. F. W. Mansfield and partners	Do. . .	P. L. .	554.80	Do. .	Do.

## NORTH WEST FRONTIER PROVINCE.

Shah .	(759) Mr. R. G. Tugwood through Mr. E. Parsons, Attorney.	Mineral Oil	P. L. .	5,760	3rd April 1924.	1 year.
Do. .	(760) Edwin John Beer, Esq.	All other minerals except oil, i.e., precious stones, gold and ores particularly stannum and sulphur.	P. L. (renewal)	640	20th June 1924.	Do.

P. L.—Prospecting License.  
M. L.—Mining Lease.

## PUNJAB.

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Jhelum .	(761) Messrs. Thakar Dass Ranji Das.	Coal . . .	P. L. .	37.12	15th April 1924	1 year.
Do. .	(762) K. B. Raja Painsa Khan.	Do. . . .	P. L. .	280	14th June 1924.	Do.
Do. .	(763) Do. .	Do. . . .	P. L. .	46.5	29th July 1924.	Do.
Do. .	(764) Do. .	Do. . . .	P. L. .	22	2nd September 1924.	Do.
Do. .	(765) Whitehall Petroleum Corporation, Ltd., The Mall, Lahore.	Do. . . .	P. L. .	1,472	5th September 1924.	Do.
Mianwali .	(766) Messrs. Jiwan Das Daulat Ram & Jodha Ram.	Do. . . .	P. L. .	1,791	11th February 1924.	Do.
Do. .	(767) Do. .	Do. . . .	P. L. .	3,911	Do. .	Do.
Do. .	(768) Do. .	Do. . . .	P. L. .	1,500	Do. .	Do.
Shahpur .	(769) The Punjab Coal Syndicate.	Do. . . .	P. L. .	185.37	10th January 1924.	Do.

P. L. = *Prospecting license.*

## SUMMARY.

Province.	Exploring License	Prospecting License.	Mining Lease.	Total of each Province.
Assam . . . . .	..	14	..	14
Baluchistan . . . . .	1	1	8	10
Bihar and Orissa . . . . .	..	5	7	12
Bombay . . . . .	..	4	..	4
Burma . . . . .	..	216	15	231
Central Provinces . . . . .	..	334	75	450
Madras . . . . .	..	19	9	28
N. W. F. Province . . . . .	..	2	..	2
Punjab . . . . .	..	9	..	9
Total of each kind and Grand Total for 1924.	1	654	114	769
Total for 1923 .	1	513	110	624



TABLE 41.--*Prospecting Licenses granted in Assam during 1924.*

DISTRICT.	1924.		
	No.	Area in acres.	Mineral.
<b>Prospecting Licenses.</b>			
Cachar. . . . .	3	9,638.4	Mineral oil.
Garo Hills . . . . .	1	6,700.8	Coal.
Kamrup . . . . .	1	4,665.6	Oil and Coal
Khasi and Jaintia Hills . . . . .	1	2,880	Coal.
Lakhimpur . . . . .	2	13,120	Do.
Do. . . . .	1	832	Oil
Nowgong . . . . .	2	32.4	Mineral oil.
Sadiya Frontier Tract . . . . .	1	2240	Do.
Sylhet . . . . .	2	10,336	Do.
TOTAL . . . . .	14	..	

TABLE 42.--*Exploring and Prospecting Licenses and Mining Leases granted in Baluchistan during 1924.*

DISTRICT.	1924.		
	No.	Area in acres.	Mineral.
<b>Exploring License.</b>			
Zhob . . . . .	1	102,400	Mineral oil.
<b>Prospecting License.</b>			
Kalat . . . . .	1	480	Mineral oil.
<b>Mining Leases.</b>			
Kalat . . . . .	1	80	Coal.
Sibi . . . . .	1	80	Do.
Zhob . . . . .	6	70	Chromite.
TOTAL . . . . .	8	..	

TABLE 43.—*Prospecting Licenses and Mining Leases granted in Bihar and Orissa during 1924.*

DISTRICT.	1924.		
	No.	Area in acres.	Mineral.
<b>Prospecting Licenses.</b>			
Angul . . . . .	1	25,600	All minerals.
Do. . . . .	1	6,400	Red Ochre.
Singhbhum . . . . .	1	224	Iron-ore.
Do. . . . .	2	281.24	Manganese.
TOTAL . . . . .	5	..	

<b>Mining Leases.</b>			
Santal Parganas . . . . .	1	0.33	Coal.
Singhbhum . . . . .	1	1,836.8	Haematite and Manganese.
Do. . . . .	1	225.20	Iron-ore and Manganese.
Do. . . . .	2	480	Iron-ore.
Do. . . . .	1	143.68	Chromite.
Do. . . . .	1	573.0	Manganese.
TOTAL . . . . .	7	..	

TABLE 44.—*Prospecting Licenses granted in the Bombay Presidency during 1924.*

DISTRICT.	1924.		
	No.	Area in acres.	Mineral.
<b>Prospecting Licenses.</b>			
Belgaum . . . . .	1	319.98	Manganese-ore.
Kanara . . . . .	3	126.3	Do.
TOTAL . . . . .	4	..	

TABLE 45.- *Prospecting Licenses and Mining Leases granted in Burma during 1924.*

DISTRICT.	1924.		
	No.	Area in acres.	Mineral.
Akyab . . . . .	4	10,338 27	Mineral oil.
Amherst . . . . .	2	652 80	All minerals (except oil).
Bhamo . . . . .	1	3,328	All minerals (except natural petroleum and precious stone).
Katha . . . . .	2	1,160	All minerals (except oil).
Lower Chindwin . . . . .	8	31,584	Mineral oil.
Magwe . . . . .	14	26,095	Do.
Mandalay . . . . .	1	2,000	All minerals except oil.
Do. . . . .	1	640	Iron-ore.
Meiktila . . . . .	1	1,850	Mineral oil.
Mergui . . . . .	10	8,848 96	All minerals except oil.
Do. . . . .	18	15,380 78	Tin-ore.
Do. . . . .	11	11,941 12	Tin and allied minerals.
Do. . . . .	4	4,899 84	Tin and all minerals except oil.
Do. . . . .	4	2,447 36	Tin and other minerals.
Do. . . . .	1	614 63	Cassiterite.
Do. . . . .	1	1,295 36	Tin and Wolfram.
Minbu . . . . .	1	1,920	All minerals including mineral oil.
Do. . . . .	2	4,486 85	Mineral oil.
Myingyaung . . . . .	7	17,132 96	Do.
Myitkyina . . . . .	1	9,984 0	Gold.
Northern Shan States . . . . .	1	1,920	All minerals and precious stones.
Do. . . . .	2	1,280	All minerals except oil.
Do. . . . .	2	545	Iron-ore.
Do. . . . .	1	3,238 4	Coal and iron.
Pakokku . . . . .	11	20,186	Mineral oil.
Prome . . . . .	3	3,256 16	Do.
Sagaing . . . . .	1	7,040	Do.
Salween . . . . .	1	19,200	Gold.
Shwebo . . . . .	5	16,320	Mineral oil.
Southern Shan States . . . . .	10	25,679 20	All minerals except oil.
Do. . . . .	2	2,560	Mineral oil.
Tavoy . . . . .	19	9,135 80	Tin and Wolfram.
Do. . . . .	14	6,400	All minerals except oil.
Do. . . . .	12	7,387 1	Tin and allied minerals.
Do. . . . .	3	431	Tin.
Do. . . . .	1	400	Tin and other minerals.
Thaon . . . . .	1	505 60	Tin.

TABLE 46. --*Prospecting Licenses and Mining Leases granted in Burma during 1924—* *concl.*

DISTRICT.	1924.		
	No.	Area in acres.	Mineral.

**Prospecting Licenses—concl.**

Phayemyo . . . . .	21	85,146.96	Mineral oil.
Upper Chindwin . . . . .	8	27,878.4	Do.
Do. . . . .	1	5,639.6	All minerals except oil.
Do. . . . .	2	3,820.8	Coal.
Do. . . . .	1	1,824	Mineral oil and Coal.
<hr/>			
TOTAL . . . . .	216	..	

**Mining Leases.**

Amberst . . . . .	2	3,519.92	Tin ore.
Henzada . . . . .	1	94.76	Copper pyrites.
Magwe . . . . .	2	1,280	Natural petroleum.
Mergui . . . . .	2	2,391.04	All minerals except oil
Do. . . . .	1	609.28	Tin ore.
Do. . . . .	1	3,527.68	Tin and Wolfram.
Minbu . . . . .	1	356	Mineral oil.
Prome . . . . .	2	2,509.23	Do.
Southern Shan States . . . . .	1	2.11	Lead and Silver.
Tavoy . . . . .	1	236.73	All minerals except oil
Thaton . . . . .	1	687.78	Tin.
<hr/>			
TOTAL . . . . .	15	..	

TABLE 47.--*Prospecting Licenses and Mining Leases granted in the Central Provinces during 1924.*

DISTRICT.	1924.		
	No.	Area in acres.	Mineral.
<b>Prospecting Licenses.</b>			
Balaghat . . . . .	148	18,929	Manganese.
Betul . . . . .	3	959	Coal.
Bhandara . . . . .	33	4,497	Manganese.
Bilaspur . . . . .	2	258	Mica.
Chanda . . . . .	1	810	Coal.
Chhindwara . . . . .	23	2,400	Manganese.
Do. . . . .	12	2,274	Coal.
Do. . . . .	1	548	All minerals except oil
Hoshangabad . . . . .	1	248	Coal.
Jubbulpore . . . . .	20	1,338	Manganese.
Do. . . . .	1	111	Bauxite.
Do. . . . .	1	14	Manganese, gold and silver
Mandla . . . . .	1	86	Mica.
Nagpur . . . . .	134	18,686	Manganese.
Seoni . . . . .	3	517	Do.
TOTAL . . . . .	384	..	-

**Mining Leases.**

Balaghat . . . . .	1	11	Iron Ore.
Do. . . . .	28	893	Manganese.
Betul . . . . .	3	2,514	Coal.
Bhandara . . . . .	3	42	Manganese.
Chanda . . . . .	1	591	Coal.
Chhindwara . . . . .	9	1,677	Do.
Do. . . . .	3	61	Manganese.
Jubbulpore . . . . .	3	43	Do.
Nagpur . . . . .	24	704	Do.
TOTAL . . . . .	75	..	-

TABLE 48.—*Prospecting Licenses and Mining Leases granted in Madras during 1924.*

DISTRICT.	1924.		
	No.	Area in acres.	Mineral.
<b>Prospecting Licenses.</b>			
Anantapur . . . . .	1	1,769	Gold.
Bellary . . . . .	1	85	Red Earth.
Do. . . . .	3	1,971.43	Manganese.
Cuddapah . . . . .	1	39.65	Barytes.
Do. . . . .	2	1,002.39	Asbestos.
Kurnool . . . . .	7	68.23	Barytes.
Nellore . . . . .	2	9.38	Mica.
Nilgiri . . . . .	2	900.76	Do.
TOTAL . . . . .	19	..	

<b>Mining Leases.</b>			
Bellary . . . . .	2	2,152.39	Hematite.
Nellore . . . . .	6	152.94	Mica.
Nilgiri . . . . .	1	46.00	Do.
TOTAL . . . . .	9	..	

TABLE 49.—*Prospecting Licenses granted in North-West Frontier Province during 1924.*

DISTRICT.	1924.		
	No.	Area in acres.	Mineral.
Kohat . . . . .	1	5,760	Mineral oil.
Do. . . . .	1	640	All minerals except oil.
TOTAL . . . . .	2	..	

TABLE 50.—*Prospecting Licenses granted in the Punjab during 1924.*

DISTRICT.	1924.		
	No.	Area in acres.	Mineral.
Jhelum . . . . .	5	1,857·47	Coal.
Mianwali . . . . .	3	7,205	Do.
Shahpur . . . . .	1	185·37	Do.
TOTAL .	9	..	

## NOTE ON THE ENSTATITE-AUGITE SERIES OF PYROXENES.

BY L. LEIGH FERMOR, O.B.E., D.SC., A.R.S.M., F.G.S.,

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[N his valuable paper on the Deccan Traps and Other Plateau Basalts<sup>1</sup> Dr. Washington brings out a new point of importance, namely that the pyroxene commonly referred to as augite is really an *enstatite-augite*. This statement is based on optical determinations by Dr. H. E. Merwin on the augite of specimens from Chhindwara, Seoni and Neemuch, and on the chemical analyses of the basalts by Washington himself. Dr. Merwin found that the optic axial angle  $2V$  is very small, up to about  $30^\circ$  in the plane of symmetry, and obtained the refractive indices  $\alpha=1.700=1.710$  and  $\gamma=1.725-1.735$ : whilst the chemical analyses indicate in the norm, based on the average of eleven analyses, practically equal proportions of diopside (17.41 per cent.) and hypersthene (17.78 per cent.).

A measurement by myself of the optic axial angle in a crystal in slide 13809 from flow 25 of the Bhusawal lavas gave, by comparison with muscovite, a value of  $2E = 38^\circ \pm 4^\circ$ ; from this, taking  $\beta=1.715$ ,  $2V=21^\circ \pm 2^\circ$ . This confirms the above result, and there seems in fact to be little doubt that the augite of the Deccan Traps belongs to the enstatite-augite series of Wahl. Further, the analyses recorded by Washington<sup>2</sup> of the plateau basalts of other parts of the world, *e.g.* from the Oregonian, and the Arcto-Britannic or Thulean provinces, show that the pyroxene in these basalts must also belong to this series, and this has been confirmed by optical measurements where such have been made, namely by Holmes<sup>3</sup> on the basalts of Iceland and the Faroes. When one considers the vast tracts of country covered by the plateau basalts in different parts of the world, *e.g.* of the order of 200,000 sq. miles in both India (Deccan) and the N. W. United States (Oregonian), and the considerable thickness of these accumulations (6000 feet or more in India, *e.g.*), one is forced to the conclusion that the pyroxenes of the enstatite-augite series are probably the most abundant pyroxenes in nature, at least in the rocks exposed at the surface.

<sup>1</sup> *Bull. Geol. Soc. Amer.*, Vol. 33, pp. 765-803, (1922).<sup>2</sup> *L.c.*, pp. 779, 784, 787, 790.<sup>3</sup> *Min. Mag.*, XVIII, pp. 192, 195, 200, (1917).



The importance of the pyroxenes of the enstatite-augite series has, however, not yet been generally recognised, the majority of standard textbooks on petrography and mineralogy being completely silent thereon, whilst none of them give the characters by which these pyroxenes are to be recognised<sup>1</sup>. It will be useful, therefore, to give a brief summary of the nomenclature and literature of this series.

Omitting from the discussion the manganesian pyroxenes grouped under schefferite, the most constant chemical characteristic of the varieties grouped by Dana under the monoclinic mineral pyroxene<sup>2</sup>, is the molecular equality of CaO to other protoxides in the meta-silicate molecules of the type  $\text{RSiO}_3$ , ranging as a series from pure diopside  $\text{CaMg}(\text{SiO}_3)_2$ , through varieties of the composition  $\text{Ca}(\text{Mg,Fe})(\text{SiO}_3)_2$ , to pure hedenbergite  $\text{CaFe}(\text{SiO}_3)_2$ . The alumina in the varieties grouped under augite is regarded as present in what is known as Tschermak's silicate,  $\text{MgO} \cdot \text{Al}_2\text{O}_3 \cdot \text{SiO}_2$ , or, more generally,  $(\text{Mg,Fe})(\text{Al,Fe})_2\text{SiO}_6$ .

The minerals of the pyroxene group with little or no lime, consisting essentially of  $\text{MgSiO}_3$  and  $\text{FeSiO}_3$ , are found commonly to belong to the enstatite-hypersthene series of orthorhombic crystallisation, and in general petrographic work it appears not to be generally recognised that there is a third important form of pyroxene of similar chemical composition to the enstatite-hypersthene series but of monoclinic crystallisation. This pyroxene was first made known as an artificial product obtained synthetically by Ebelmen<sup>3</sup> so long ago as 1851 by melting together magnesia and silica with boric acid as flux. Ebelmen showed the substance to be  $\text{MgSiO}_3$  and biaxial. Later Fouqué and Michel-Lévy<sup>4</sup> examined Ebelmen's specimens microscopically and found the mineral to be clearly monoclinic with polysynthetic twinning parallel to the orthopinacoid, and with the optic axial plane parallel to the traces of the twins, that is at right angles to the clinopinacoid. Fouqué and Lévy also record the presence of this *magnesian pyroxene* (pyroxène magnésien), to use their name, in natural and artificial preparations by Hautefeuille

<sup>1</sup> The only works of a general type in which I have found a reference to this series are, in fact, Idding's 'Igneous Rocks', where they are discussed (Vol. I, pp. 136-138, 1909) under 'Pyroxenes, Mixed Salts'; and Lacroix' 'Minéralogie de la France et de ses Colonies', IV, pp. 767-8, (1910), under *pigeonite*.

<sup>2</sup> System of Mineralogy, 6th Edit., p. 344, (1904).

<sup>3</sup> *Ann. Chim. Phys.*, 3me Série, XXXIII, p. 58.

<sup>4</sup> 'Synthèse des Minéraux et des Roches', pp. 68, 108, (1882).

and Stanislas Meunier. In 1894 Cohen<sup>1</sup> wrongly suggested the application to this substance of the term *magnesium-diopside*, which was subsequently (1905) and with more correctness applied by Rosenbusch<sup>2</sup> to the mixed pyroxene low in lime occurring in many diabases and basalts and possessing a small optic axial angle.

In 1907 W. Wahl<sup>3</sup> published, under the title of 'Die Enstatit-augite', the results of a comprehensive research into the monoclinic pyroxenes of low optic axial angle, poor in lime and rich in magnesia. The monoclinic pyroxene of meteorites, Fouqué and Lévy's magnesian pyroxene, he names (*l.c.*, p. 121) *clinoenstatite* (klingenstatite, etc.) with *clinobronzite* and *clinohypersthene* for the more ferruginous varieties; and he shows that the pyroxene of certain diabases with low lime contents can be regarded as mixtures of the clinoenstatite-clinohypersthene series with the diopside-hedenbergite series in varying proportions, frequently with the presence in the latter of a certain amount of  $\text{Al}_2\text{O}_3$ , present not as the Tschermak silicate  $\text{MgO} \cdot \text{Al}_2\text{O}_3 \cdot \text{SiO}_2$ , but probably as a new silicate  $\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot \text{SiO}_2$ , the reason for this change of view concerning Tschermak's silicate being obvious, once the presence of the  $\text{MgSiO}_3$  molecule in these mixtures has been admitted. On account of the similarity of the *clino* series to the enstatite series in chemical composition he proposed for the mixed series of pyroxenes the general name *enstatite-augite*, with the possibility of more exact description of varieties the composition of which is actually known, *e.g.* hypersthene-hedenbergite, bronzite-augite. This nomenclature could be rendered still more precise by adding the prefix *clino* before enstatite, etc.

After the clarity introduced into the nomenclature by Wahl, one feels compelled to demur to a suggestion of Prior's, which, if adopted, would again introduce confusion into the nomenclature. Prior writes as follows :—

"As regards the monoclinic pyroxenes, those which occur in meteorites, with exceptions, are very poor in lime and alumina as compared with terrestrial augites, and thus in chemical composition approximate to or are identical with the orthorhombic forms. It is proposed, therefore, to extend the use of the very satisfactory self-explanatory terms *clinoenstatite*, *clinobronzite*, and *clinohypersthene*, so as to cover not only the twinned monoclinic pyroxenes of the chondrites to which Wahl restricted the terms, but also the monoclinic pyroxenes of small optic axial angle of his 'enstatite-augite' series."<sup>4</sup>

<sup>1</sup> 'Meteoritenkunde', I, p. 301, (1894).

<sup>2</sup> 'Mikroskopische Physiographie', I, 2nd Half, p. 206.

<sup>3</sup> Tschermak's *Min. u. Pet. Mittheil.*, New Series, XXVI, pp. 1-131, (1907).

<sup>4</sup> 'The Classification of Meteorites', *Min. Mag.*, p. 56, (1920).

It cannot be too strongly emphasised that clinoenstatite has a large optic axial angle ( $2V=53^{\circ}5$ ) close to that of diopside ( $2V=59^{\circ}3$ ), whilst the mixed pyroxenes of the enstatite-augite series of Wahl have low optic axial angles (e.g.  $8^{\circ}$  to  $46^{\circ}$ ). Prior's proposal to distinguish clinoenstatites, etc., that contain appreciable (though still relatively small) amounts of lime as *calcareous* or as *calc-enstatite*, etc., seems much more acceptable.

Wahl's research enables him to offer a definite explanation for the small optic axial angle so characteristic of these mixtures. In the diopside-hedenbergite series the optic axial plane is parallel to the clinopinacoid, whilst in the clinoenstatite-clinohypersthene series the optic axial plane is at right angles to the clinopinacoid<sup>1</sup>. The optic axial angles ( $2V$ ) of these two substances are not very dissimilar, namely using the accurate American data referred to below,  $59^{\circ}3$  for pure diopside and  $53^{\circ}5 \pm 1^{\circ}$  for clino-enstatite. According to Wahl (*l.c.*, pp. 110-118), the addition to diopside of clinoenstatite in increasing proportion should cause a progressive lowering of the optic axial angle in the plane of the clinopinacoid to a zero figure for some particular proportion of the two substances, followed by a gradual opening of the optic axes in the plane at right angles to the clinopinacoid, as the amount of  $MgSiO_3$  increases. It is not difficult to imagine this process as the  $\angle$  ether axes of the two minerals are not very far apart: for diopside the angle  $\angle \wedge c' = 32^{\circ}8$  and for clino-enstatite  $21^{\circ}8$ .

More exactness has been given to some aspects of this problem by the experimental work done at the Geophysical Laboratory in Washington. Clinoenstatite artificially prepared is discussed under the name *Mg-pyroxene* in a paper by Allen, Wright and Clement published in 1906<sup>2</sup>, and by Allen, White, Wright and Larsen, in 1909<sup>3</sup>, in a paper on 'Diopside and its Relations to Calcium and Magnesium Metasilicates'. From the latter paper it appears that there are five forms of  $MgSiO_3$ , namely two pyroxenes, enstatite and  $\beta$ - $MgSiO_3$  (clinoenstatite), two amphiboles, kupfferite (orthorhombic) and a monoclinic form similar to kupfferite, and finally an orthorhombic

<sup>1</sup> This fact and the position of the optic axial plane in orthorhombic enstatite intergrown with monoclinic augite, appear to me to favour the general adoption of a crystallographic orientation for enstatite and hypersthene by which the optic axial plane is at right angles to (010): this has been done, e.g. in Weinschenck and Clark's 'Petrographic Methods', p. 278, (1912).

<sup>2</sup> 'Minerals of the Composition  $MgSiO_3$ : A Case of Tetramorphism', *Amer. Journ. Sci.*, Fourth Ser., XXII, pp. 385-438.

<sup>3</sup> *Op. cit.*, XXVII, pp. 1-47.

form ( $\alpha$ - $\text{MgSiO}_3$ ) recalling forsterite in habit and optical properties.  $\beta$ - $\text{MgSiO}_3$  is stable up to  $1365^\circ$ , when it passes over into  $\alpha$ - $\text{MgSiO}_3$ : the other three forms are all on heating monotropic towards  $\beta$ - $\text{MgSiO}_3$  or clinoenstatite.

From these two papers the optical properties of clinoenstatite or  $\beta$ - $\text{MgSiO}_3$  may be summarised as follows:—  $\gamma=1.658$ ;  $\gamma-\alpha=0.011$ ; optic axial plane normal to the plane of symmetry (010);  $\epsilon:c=21.8^\circ$ ; optic axial angle  $2V=53^\circ.5$ , or  $2E=96^\circ$ : positive. Crystallographically, the mineral is closer to enstatite than to diopside: polysynthetic twinning parallel to the orthopinacoid is characteristic.

The parallel data for enstatite are:  $\gamma=1.652$ ;  $\gamma-\alpha=0.012$ ; position of optic axial plane *au choix*; straight extinction; optic axial angle uncertain,  $2V=31^\circ$  (Bishopville meteorite),  $25^\circ$ - $35^\circ$  (artificial enstatite),  $70^\circ$  (natural enstatite, Lacroix).

For pure diopside the data are:—

$\gamma=1.694$ ;  $\gamma-\alpha=0.030$ : optic axial plane parallel to the plane of symmetry,  $\epsilon:c=-38^\circ.5 \pm 1^\circ$ ; optic axial angle  $2V=59^\circ.3 \pm 1^\circ$ : positive.

Messrs. Allen, White, Wright and Larsen, in their study of diopside and its relations to calcium and magnesium metasilicates, found six series of solid solutions of the system  $\text{CaSiO}_3$ - $\text{MgSiO}_3$ . For our purpose only two of these series need be considered, namely solid solutions of  $\text{MgSiO}_3$  in diopside and of diopside in  $\beta$ - $\text{MgSiO}_3$ . Diopside (46.3 per cent.  $\text{MgSiO}_3$ , 53.7 per cent.  $\text{CaSiO}_3$ ) was found to dissolve up to 60 per cent. of  $\text{MgSiO}_3$ , giving solutions or mixed crystals containing 66.5 per cent.  $\text{MgSiO}_3$  and 33.5 per cent.  $\text{CaSiO}_3$ , these solutions showing a gradual but noticeable change of optical properties as follows:—

	$\gamma-\alpha$	$2V$	$\epsilon:c$ on (110).
Diopside (46.3 per cent. $\text{MgSiO}_3$ ) . . . . .	0.030	$59^\circ.3$	$32^\circ.4$
Mixed crystals with 66.5 per cent. $\text{MgSiO}_3$ . . . . .	0.023	$53^\circ.6$	$27^\circ.0$
$\beta$ - $\text{MgSiO}_3$ . . . . .	0.011	$53^\circ.5$	—

Beyond 68 per cent.  $\text{MgSiO}_3$  the preparations appear inhomogeneous, with  $\beta$ - $\text{MgSiO}_3$  intergrown with diopside and usually occupying the centre of large diopside sections, with cleavage lines in continuity. The  $\beta$ - $\text{MgSiO}_3$  is characterised by polysynthetic twinning parallel to (100), weak birefringence, and by the position of

the optic axial plane parallel to the twinning lamellæ; whereas in the enclosing diopside the optic axial plane is at right angles to the direction of the twinning lamellæ of the  $\beta$ - $\text{MgSiO}_3$ . At the other end of the series  $\beta$ - $\text{MgSiO}_3$  can take into solution only 2 per cent. of diopside. The range of mixed crystals of pure diopside and pure clinoenstatite ( $\beta$ - $\text{MgSiO}_3$ ) is thus from 46.3 per cent.  $\text{MgSiO}_3$  to 66.5 per cent.  $\text{MgSiO}_3$ .

It is important to ascertain whether the enstatite-augites studied by Wahl fall within these limits of composition. According to Wahl (*l.c.*, p. 112) the ratio of  $\text{CaO} : \text{FeO} + \text{MgO}$  in certain pyroxenes of this series is about 1 : 6. A ratio of  $\text{CaO} : \text{MgO} = 1 : 6$  corresponds to diopside 22.77 per cent. and  $\text{MgSiO}_3$  77.23 per cent., a proportion for which the mixtures are inhomogeneous according to the work of the American authors. As Wahl's specimens were clearly homogeneous, the meaning of this is that the range for homogeneous mixtures of the ferruginous varieties of diopside and enstatite is a larger one, and it is evident that a research into the system  $\text{CaSiO}_3$ - $\text{FeSiO}_3$  is necessary before the experimental data will suffice for the complete explanation of the mixed crystals of the diopside-hedenbergite series with the clinoenstatite-clinohypersthene series.

Taking Washington's average of analyses of 11 Deccan basalts, the norm is found to contain:—<sup>1</sup>

Diopside . . . . .	17.65 per cent.
Hypersthene . . . . .	17.55 per cent.

composed as follows:—

Diopside : (salite). . . . .	$\left\{ \begin{array}{l} \text{CaSiO}_3 \\ \text{MgSiO}_3 \\ \text{FeSiO}_3 \\ \text{MnSiO}_3 \end{array} \right\}$	$\left\{ \begin{array}{l} 8.93 \\ 4.53 \\ 4.12 \\ 0.07 \end{array} \right\}$	17.65 per cent.
Hypersthene : . . . . .	$\left\{ \begin{array}{l} \text{MgSiO}_3 \\ \text{FeSiO}_3 \\ \text{MnSiO}_3 \end{array} \right\}$	$\left\{ \begin{array}{l} 9.12 \\ 8.29 \\ 0.14 \end{array} \right\}$	17.55 per cent.

Although the total amount of  $\text{MgSiO}_3$  in the mixed crystals is only 38.77 per cent., yet the total amount of  $\text{MgSiO}_3 + \text{FeSiO}_3$  present is 74.03 per cent., as compared with the maximum of 66.5 per cent.  $\text{MgSiO}_3$  in mixed crystals of pure diopside and pure clinoenstatite,

<sup>1</sup> Washington gives the complete norm on p. 775 of his paper; but on calculating the norm for myself using the tables given in the 'Quantitative Classification of Igneous Rocks', 1903, I obtained figures differing slightly for every mineral from those shown by Washington. His figures for diopside and hypersthene are respectively 17.41 per cent. and 17.78 per cent.

and corresponding to the solution of nearly 100 per cent. of clinohypersthene in salite, as compared with a maximum of 60 per cent. of pure clinoenstatite in pure diopside. As the crystals of the Indian enstatite-augite are seen under the microscope to be homogeneous, they provide another illustration of the wider range for homogeneous mixtures of the ferruginous varieties of the diopside-hedenbergite series with the clinoenstatite-clinohypersthene series referred to in the previous paragraph.

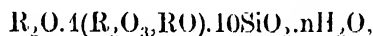
The extinction angles of these minerals are of interest. Those ( $\epsilon : c$ ) of the diopside series range from  $38^{\circ}5$  for pure diopside to  $48^{\circ}$  for hedenbergite, whilst for pure clinoenstatite the value of this angle is  $21^{\circ}8$  (experimental),  $24^{\circ}$  on the clinobronzites studied by Lacroix (*l. c.*, p. 766) and  $28^{\circ}$  in the artificial specimens studied by Fouqué and Lévy (but only  $13\frac{1}{2}^{\circ}$  in some artificial crystals prepared by Wahl, *l. c.*, p. 107). In the case of mixtures of the minerals of these two series a formula of Mallard quoted by Wahl (*l. c.*, p. 116) shows that the extinction angles of the mixed pyroxenes should be nearer to the members of higher extinction angles and higher birefringence, in this case the diopside-hedenbergite series. In the examples measured by him, Wahl found, in fact, extinction angles ( $\epsilon : c$ ) ranging from a little below  $40^{\circ}$  in the pyroxene of a eucrite up to  $45^{\circ}$  in the pyroxene of a diabase, *i.e.*, figures approaching the extinction angles of the hedenbergite end of the diopside-hedenbergite series. In the Bhusawal traps the best value I obtained was on the arrow-shaped twin in slide 13808 already referred to in the paper in the previous part of these *Records* (page 188). The value of  $\epsilon : c$  was  $43^{\circ}$  in each half of the twin.

Wahl also showed (*l. c.*, p. 27) in the case of a pyroxene in a diabase that the extinction angle decreased with the optic axial angle: namely that with a decrease in  $2E$  from  $73^{\circ}$  in the outer part of a crystal to  $48\frac{3}{4}^{\circ}$  in the inner part of the crystal (or in  $2V$  from roughly  $34^{\circ}$  to  $26^{\circ}$ ) the extinction angle decreased by from  $4^{\circ}$  to  $5^{\circ}$ , presumably from  $45^{\circ}$ , the value given. Analysis shows the pyroxene to be a mixture of hedenbergite and slightly ferruginous  $MgSiO_3$ .

NOTE ON THE CONSTITUTION OF GLAUCONITE AND CELADONITE. BY L. LEIGH FERMOR, D.Sc., O.B.E., A.R.S.M., F.G.S., *Officiating Director, Geological Survey of India.*

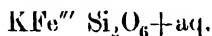
IN a recent paper published in the *Mineralogical Magazine*<sup>1</sup> Mr. A. F. Hallimond discusses the constitution of *glauconite*, selecting as material for this discussion 12 analyses from various localities.

In order to examine the constitution of the mineral, Mr. Hallimond recalculates the above analyses in terms of molecular proportions, representing the amount of silica as 1000 in each case. He then tabulates the molecular proportions of  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3$ ,  $\text{FeO} + \text{MgO}$ , and  $\text{K}_2\text{O} + \text{Na}_2\text{O}$ , for each analysis and finds no obvious constant proportion. But by treating the  $(\text{Fe}, \text{Mg})\text{O}$  and  $(\text{Fe}, \text{Al})_2\text{O}_3$  as mutually replaceable he deduces the simple formula;—

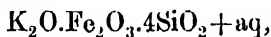


the ratio of bases to silica being 1 : 2.

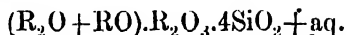
In making this suggestion Mr. Hallimond must have been aware of the formula proposed by F. W. Clarke, for he refers to the list of 15 analyses of *glauconite*<sup>2</sup> tabulated by C. K. Leith in the paper in which occurs Clarke's discussion of the composition of *glauconite* and *greenalite*. Clarke regards the  $\text{FeO}$ ,  $\text{CaO}$ ,  $\text{MgO}$ , and  $\text{Na}_2\text{O}$ , as replacing  $\text{K}_2\text{O}$ , and the  $\text{Al}_2\text{O}_3$  as replacing  $\text{Fe}_2\text{O}_3$ , and arrives at the conclusion that *glauconite* in its purest form must be regarded as a *metasilicate* approximating more or less closely to the typical compound :—



This can be expanded into :—



or expressed more generally as :—



<sup>1</sup> 'On Glauconite from the Greensand near Lewes, Sussex; the Constitution of Glauconite,' *Min. Mag.*, XIX, pp. 330-333, (1922).

<sup>2</sup> 'The Mesabi Iron-bearing District of Minnesota,' *Monogr. U. S. Geol. Surv.*, XI lii p. 240, (1903).

Mr. Hallimond's data, I find, correspond with this very closely, for the average of his 12 analyses gives the following figures :—

	Molecular proportions.	Clarke's interpretation.	Hallimond's interpretation.
SiO <sub>2</sub> . . . . .	1000	1000 (1)	1000 (10)
Al <sub>2</sub> O <sub>3</sub> + Fe <sub>2</sub> O <sub>3</sub> . . . . .	249	249 (1)	} 397 (4)
FeO : MnO . . . . .	148	} 251 (1)	
K <sub>2</sub> O + Na <sub>2</sub> O . . . . .	103		103 (1)

In the absence of any method of deciding between these two interpretations it would become a matter of personal preference which one to adopt; and in such case Clarke's interpretation would at first sight appear to be the more probable, as it does not require one to treat the sesquioxide and protoxide groups as mutually replaceable.

It seems possible, however, that light may be thrown on this problem by a study of the composition of *celadonite*, which appears to be a closely related substance. In fact it is the study of a series of Deccan Trap rocks from Blusawal in the Bombay Presidency that has caused me to take an interest in these two minerals, celadonite and glauconite. The basalts of the Deccan Trap frequently contain the substance known as *green-earth*, which is treated by Dana ('System of Mineralogy,' 6th Edition, page 683) as in part celadonite and in part glauconite. The Indian 'green-earth' occurs in part as a lining to vesicular cavities, where it appears to be a definite mineral, and in part as an alteration product of basalt, in which case it is seen under the microscope to be an aggregate of which one constituent appears to be the same as the substance lining the cavities.

An attempt to attach a name to the Indian mineral receives little help from the data relative to celadonite and glauconite given in Dana. Apparently, celadonite has a higher specific gravity (2.57 to 2.63) than glauconite (2.2 to 2.4); but later work on glauconite



has led to higher figures (*e.g.*, 2.70 for the material from Lewes described by Mr. Hallimond and 2.2 to 2.83 given by Lacroix),<sup>1</sup> so that this criterion disappears. Apparently, also according to Dana, celadonite is the more refractory to acids, not being attacked by hydrochloric acid, whilst glauconite sometimes is. But this partial difference also disappears, for according to Lacroix celadonite is attacked by boiling hydrochloric acid.

A study of the data summarised by Lacroix in the work cited yields in fact only one diagnostic character, namely, that the cryptocrystalline structure of the rounded grains of glauconite is very characteristic and enables one to distinguish this mineral from celadonite. This does not appear to be an essential difference and in fact the principal difference between glauconite and celadonite according to Lacroix is one of mode of occurrence. Glauconite is found exclusively in sedimentary formations of marine origin, whilst celadonite is a product of secondary alteration formed from (1) volcanic rocks, (2) metamorphic rocks, of which the former mode of occurrence is by far the more common. This distinction between the origin and mode of occurrence of the two substances was also made by Heddle, who placed glauconite with the 'chlorites' and celadonite with the 'saponites,' concerning the latter of which he states that they are confined invariably to volcanic rocks.<sup>3</sup> I have accordingly attached the name celadonite to my Deccan Trap mineral, which I may mention displays the scheme of pleochroism assigned by Lacroix to celadonite. See also pages 140 to 147 of this volume of the *Records*.

An inspection of the published analyses of glauconite and celadonite does not reveal any striking chemical difference between the two minerals, but it seems desirable to investigate them a little more closely in order to ascertain whether this difference in mode of occurrence of what appear to be too closely allied varieties of the same mineral is accompanied by any significant difference of composition.

In the following table are shown side by side the limits and mean of the 12 analyses of glauconite collected by Hallimond and of 5

<sup>1</sup> 'Minéral. de la France et de ses Colonies,' I, p. 407.

<sup>2</sup> *Loc. cit.*, p. 415.

<sup>3</sup> *Trans. Roy. Soc. Edinb.*, XXIX, pp. 57-58 (1880). See also F. W. Clarke, 'The Data of Geochemistry,' pp. 440-442 (1908).

analyses of celadonite by Heddle<sup>1</sup>, representing 4 Scottish localities and the Giants' Causeway:—

	Glauconite—12 analyses.			Celadonite—5 analyses.		
	Limits.		Mean.	Limits.		Mean.
SiO <sub>2</sub> . .	46.90	51.24	49.11	51.74— 57.72		54.22
Al <sub>2</sub> O <sub>3</sub> . .	1.53—	15.21	8.03	0.33— 5.82		3.70
Fe <sub>2</sub> O <sub>3</sub> . .	30.83—	10.56	20.05	17.05— 9.71		12.50
FeO . .	0.89—	5.96	3.05	3.73— 5.40		4.75
MnO . .	..	..	..	Tr. — 0.31		0.19
MgO . .	0.70—	4.54	3.18	3.84— 8.54		6.98
CaO . .	3.21—	<i>nil.</i>	0.87	0.54— 1.29		0.84
K <sub>2</sub> O . .	3.68—	7.91	6.97	5.55— 8.83		6.90
Na <sub>2</sub> O . .	3.00—	<i>nil.</i>	0.66	0.64— <i>nil.</i>		0.44
H <sub>2</sub> O . .	4.71—	11.64	8.05	6.80— 11.49		9.99
			99.97			100.51

Comparing the means it is seen that celadonite is substantially higher than glauconite in silica and magnesia and substantially lower in alumina and ferric oxide: whilst the lime, alkalies and water are very similar. In addition celadonite contains a small quantity of manganese protoxide, the presence of which has rarely been recorded in glauconite.

In discussing his glauconite analyses, Mr. Hallimond has discarded the lime as probably due to impurities, and also the water, as there is no evidence as to the extent to which it is present in definite combination. The water is so constant, however, in Heddle's 4 analyses of Scottish celadonites (10.78, 10.48, 10.41 and 11.49 per cent.) that it seems desirable to investigate whether it is present in any simple proportion.

For purposes of comparison with table II of Hallimond relating to glauconite,<sup>2</sup> the molecular proportions of the oxides present in the 5 celadonite analyses referred to above are shown below in the same

<sup>1</sup> *Loc. cit.*, p. 105, (1879), and 'The Mineralogy of Scotland,' II, p. 146, (1901).

<sup>2</sup> *L. c.*, p. 332.

form, with the water in addition. (The MnO and CaO present are included in the RO totals): -

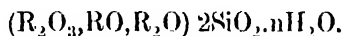
----	SiO <sub>2</sub>	R <sub>2</sub> O <sub>3</sub>	RO	R <sub>2</sub> O	R <sub>2</sub> O <sub>3</sub> + R <sub>2</sub> O	RO + R <sub>2</sub> O	R <sub>2</sub> O <sub>3</sub> + RO + R <sub>2</sub> O	H <sub>2</sub> O	R <sub>2</sub> O <sub>3</sub> + RO + R <sub>2</sub> O + H <sub>2</sub> O
1. Scur Mohr	1000	114	165	69	279	234	318	623	971
2. Tayport	1000	136	350	83	492	439	575	668	1243
3. Tay Bridge	1000	135	353	91	488	444	579	664	1244
4. Blue Hole	1000	137	319	100	456	449	556	738	1294
5. Giants' Causeway.	1000	116	247	100	363	347	463	404	867

These 5 analyses can be divided into two groups: those (nos. 2 to 4) in which the ratio  $R_2O_3 + RO + R_2O : SiO_2$  is greater than 0.5 and the ratio  $R_2O_3 + RO + R_2O + H_2O : SiO_2$  is greater than 1; and those (nos. 1 and 5) in which these ratios are less than 0.5 and 1 respectively. But whereas analyses 2 to 4 are closely similar to one another, 1 and 5 are divergent. In the following table are given the molecular ratio for celadonite based on the averages of analyses 2 to 4 and for the whole 5 analyses, and also those for glauconite based on the average of the 12 analyses given in Hallimond's paper :-

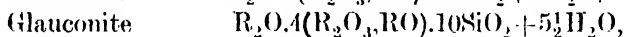
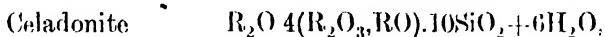
Mean	No. of analyses.	SiO <sub>2</sub>	R <sub>2</sub> O <sub>3</sub>	RO	R <sub>2</sub> O	R <sub>2</sub> O <sub>3</sub> + R <sub>2</sub> O	RO + R <sub>2</sub> O	R <sub>2</sub> O <sub>3</sub> + RO + R <sub>2</sub> O	H <sub>2</sub> O	R <sub>2</sub> O <sub>3</sub> + R <sub>2</sub> O + H <sub>2</sub> O	R <sub>2</sub> O H <sub>2</sub> O
Celadonite	3	1000	136	343	91	479	434	579	690	1260	781
Celadonite	5	1000	127	286	88	413	374	501	617	1118	705
glauconite	12	1000	219	118	103	397	251	500	550	1050	653

The first average for celadonite does not lead to any simple formula [ $2R_2O_3 \cdot 7(RO, R_2O) \cdot 16SiO_2 + 11H_2O$  is the nearest], but if the second average be adopted the composition of celadonite becomes strikingly similar to that of glauconite in some respects. In particular the ratio  $R_2O_3 + RO + R_2O : SiO_2$  is almost exactly 0.5 in both minerals. The differences consist in somewhat higher water and in a markedly higher proportion of protoxides and a lower proportion of sesquioxides in celadonite than in glauconite. At first sight the simplest procedure would appear to be to treat the  $R_2O_3$  and RO as mutually replacing one another; but the truer relationship is to regard  $R_2O_3$ , RO, and  $R_2O$  as all mutually replacing one another

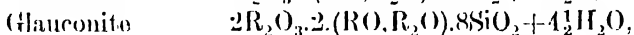
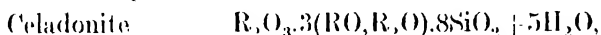
within limits, and the general formula for the two minerals then becomes :—



With Hallimond's method of expanding this the formulæ become :



the correspondence with the analytical means being closer for glauconite than for celadonite. This method of grouping together  $R_2O_3$  and RO obscures, however, the principal chemical difference between the two minerals and the formulæ are more distinctly and also more closely shown as :—



in which the molecular ratio of RO :  $R_2O$  is 7 : 2 for celadonite and 3 : 2 for glauconite.

In conclusion it must be pointed out that for both minerals the formulæ given above are based on averages and that many of the individual analyses depart considerably from these formulæ.

## APPENDIX.

Since writing the above I have seen Professor A. Lacroix' paper<sup>1</sup> in which he gives a new analysis of the celadonite of Brentonico near Monte Baldo in Italy, made by M. Raoult on material (G-2-90) 'dont la pureté ne laissait rien à désirer.'

The analysis is as follows :—

-----	Per cent.	Molecular Proportions.
SiO <sub>2</sub> . . . . .	54.30	1000
Al <sub>2</sub> O <sub>3</sub> . . . . .	5.08	} 158
Fe <sub>2</sub> O <sub>3</sub> . . . . .	11.77	
FeO . . . . .	4.82	} 256
MnO . . . . .	0.09	
MgO . . . . .	6.05	} 377
CaO . . . . .	0.80	
Na <sub>2</sub> O . . . . .	3.82	} 121
K <sub>2</sub> O . . . . .	4.85	
TiO <sub>2</sub> . . . . .	traces.	} 344
H <sub>2</sub> O . . . . .	5.64	
	100.22	

<sup>1</sup> *Bull. Soc. franç. Min.*, XXXIX, pp. 93-95, (1916).

The analysis, it will be seen, is in substantial agreement with the mean of 5 analyses of British celadonites given on p. 333, the only marked difference being a higher percentage of  $\text{Na}_2\text{O}$  and a smaller percentage of  $\text{K}_2\text{O}$ , and a considerably smaller amount of water.

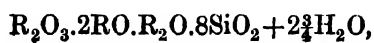
From this analysis Lacroix deduces the following proportions :—

$\text{SiO}_2$	$(\text{Fe, Al})_2\text{O}_3$	$(\text{Mg, Fe, Mn, Ca})\text{O}$	$(\text{K, Na})_2\text{O}$	$\text{H}_2\text{O}$
6.33	1	1.62	0.77	2.18
12.5	2	3	6	

The molecular proportions referred to  $\text{SiO}_2$  as 1000 are shown against the analysis on the previous page and they may be compared with average based on 5 analyses given on p. 333 as follows :—

—	British celadonites (%)	Monte Baldo	—
$\text{SiO}_2$ . . . . .	1000	1000	8
$\text{R}_2\text{O}_3$ . . . . .	127	158	1.26
$\text{RO}$ . . . . .	286	256	2.04
$\text{R}_2\text{O}$ . . . . .	88	121	0.97
$\text{R}_2\text{O}_3 + \text{RO}$ . . . . .	413	414	..
$\text{RO} + \text{R}_2\text{O}$ . . . . .	374	377	3.01
$\text{R}_2\text{O}_3 + \text{RO} + \text{R}_2\text{O}$ . . . . .	501	535	..
$\text{H}_2\text{O}$ . . . . .	617	344	2.75
$\text{R}_2\text{O}_3 + \text{RO} + \text{R}_2\text{O} + \text{H}_2\text{O}$ . . . . .	1118	879	..
$\text{R}_2\text{O} + \text{H}_2\text{O}$ . . . . .	705	465	..

Except for a slight excess of  $\text{R}_2\text{O}_3$  these proportions correspond very closely with the following formula :—



which, except for the lower  $H_2O$ , is the same as the formula adopted on p. 335 with the ratio  $RO : R_2O = 2 : 1$  instead of  $7 : 2$ . It will be noticed that the 5 analyses studied earlier in this paper offer no support to Lacroix' assumption that the alkalies and water should be grouped together in the formula.<sup>1</sup>

<sup>1</sup> In this same paper Prof. Lacroix gives an analysis of the green residue from the treatment with hydrofluoric acid of plasma from Ankaroberavina in Madagascar, and remarks (p. 94) that the figures show that the Madagascar mineral 'a certainement une composition nettement différente de la celadonite du Monte Baldo.' In the proportions given at the foot of p. 92, however, there is an obvious error, and if this be corrected the disparity is largely removed. Further, the ratio  $R_2O_3 : RO + R_2O$  is  $1 : 3.51$ , which is not so very different from the value of this ratio  $1 : 3$  (2.95) adopted by me for the British celadonites: it seems possible therefore, that the mineral from Madagascar is also a celadonite in which the ratio  $RO : R_2O$  is roughly  $2 : 1$  as with the mineral from Monte Baldo. The only difficulty appears to be the insolubility in hydrofluoric acid of the mineral from Madagascar. In his 'Minéralogie de Madagascar,' I. p. 487, (1922), Prof. Lacroix describes this mineral under 'celadonite,' without regarding it as identical from the chemical point of view. It is stated here that the plasma was treated with hydrochloric acid.

PALAGONITE-BEARING DOLERITE FROM NAGPUR: SUGGESTION REGARDING THE NATURE AND ORIGIN OF PALAGONITE.<sup>1</sup> BY D. N. WADIA, M.A., B.SC., (BOMBAY), F.G.S., F.R.G.S., *Assistant Superintendent, Geological Survey of India.* (With Plate 11).

PALAGONITE occurs on a fairly large scale in some coarsely crystallised dolerite interbedded among the lava flows of the Deccan Trap in the vicinity of Nagpur. Specimens were obtained from a quarry west of the Takli Police Lines, from beds underlying the fossiliferous intertrappean beds mentioned by Blanford (*Memoirs, Geol. Surv. Ind.*, Vol. IX, pages 295-330). The dolerite is a compact, black, coarse, crystalline, fresh-looking, rock of S. G.=2.86, with irregularly spreading and branching pits, cavities and tubes filled with palagonite, the latter constituting 15 to 20 per cent. of the bulk of the rock. Overlying this coarse-grained rock is a thick bed of fine-grained, sparsely vesicular dolerite, the vesicles having a thick botryoidal lining of palagonite on the walls. This rock also has a fresh, unweathered, black aspect; its specific gravity is 2.75.

Petrographically the first rock is a coarsely crystallised dolerite. The feldspars (labradorite) form over 50 per cent. of the rock, are perfectly clear and fresh and are usually idiomorphic (in large prisms and plates) towards augite, which is the next most abundant constituent. The augite occurs in large plates, as well as grains, and appears to enclose numerous small prisms of feldspar, and to be moulded around larger crystals of feldspar. The structure is not, however, truly ophitic, as on crossing the nicols the augite patches are seen to be aggregates rather than true idiomorphs. In places the relationship of the augite and labradorite approaches micrographic. No perfect idio-

<sup>1</sup> That palagonite is formed by the alteration not only of interstitial glass but also of augite was observed by Drs. Fermor and Fox in their work on the lavas of Linga; but as the proposed paper on the microscopic aspect of these lavas (see *Records*, Vol. XLVII, p. 133) was not prepared and published, Mr. Wadia had no access to their results, for his paper was read at the Geological Section of the Indian Science Congress at Calcutta in January 1921, i.e. before he joined this Department. The publication, in the previous part of these *Records*, of Dr. Fermor's paper on the lavas of Bhusawal, in which the nature of palagonite is also discussed, appears to afford a suitable opportunity for publication of Mr. Wadia's paper.—Ed.

morphs of augite are seen. This mineral is deep brown to grey in colour, is traversed by large wide cracks, besides its usual cleavages, and shows feeble but distinct pleochroism. Magnetite is unusually abundant, occurring in long rods and rhombs, which cut through the augite; but at times the two minerals are intergrown. There is but little apatite present, while there is a complete absence of olivine. Closely associated with the palagonite, both as loosely embedded grains and adhering to the walls of its pits and tubules, is an olive-coloured, resinous-lustred zeolite, in small crystalline granules of about 0.5 mm. diameter, with refraction and double-refraction low; it is extremely fusible, swelling up into orange-coloured intumescences on the application of a flame. Dr. Fermor has shown that similar granules occurring in some of the Bhusawal lavas are chabazite, and it seems probable that this is the same mineral.

#### PALAGONITE.

The substance here described as palagonite, which forms the most conspicuous and noteworthy part of the rock, is in all respects identical with the alteration product of basic glassy rocks usually designated by this name.

Its occurrence in the dolerite.

In the present case it appears as an infilling of large ramifying lacunæ which meander through the rock in all directions. In size these lacunæ vary from shot-like spherules of 3-5 mm. to chambers of amœboid shapes from 15-20 mm. in diameter. Only a few of the lacunæ are spheroidal in section, the majority being amœboid. A close study of these cavities, after removing all the infilling material, clearly shows that they are not original, of the nature of amygdaloidal vesicles, so characteristic of the Deccan traps; but that, as will be shown later, they are of secondary creation due to the transformation of some of the rock-constituents into palagonite, within the body of the rock. Fig. 3, Plate 11, is a sketch reproduction of one such lacuna after all the palagonite had been removed from it. It gives some idea of the way in which palagonite grows in the body of the rock, literally eating its way through some of its constituents.

The substance filling up these cavities is an amorphous, dull black, soft, friable, bituminous-looking mass, only revealing its glassy, isotropic nature when examined under the microscope. It is most extensively fractured and consequently it is so brittle and



friable that a large cavity packed with the palagonite can be quickly cleared with a quill-pen. In thin flakes the colour is dark orange

or grey-green; the lustre of the fresh unaltered substance is shining vitreous to pitchy with a typical conchoidal fracture; but, when altered, it has a dull waxy look. At times, thin films of calcite permeate the mass along numerous cracks. Granules of the zeolite above referred to are dispersed through it as well as occurring commonly along the bounding walls.

The palagonite has a hardness of 2-2.5, is infusible B. B., feebly magnetic owing to the presence of iron, and extremely brittle. Qualitative tests show the presence chiefly of iron oxide, silica and water, with some alumina, lime and magnesia. Free water is 21.5 per cent. by weight.

No colour change was observed in the palagonite at the time of fresh fracture of the rock, or its subsequent exposure. The palagonite thus differs from chlorophæite, which has otherwise a similar chemical composition and physical characters, and occurs under similar circumstances as cavity fillings in an alkaline variety of dolerite (mugearite?) described by Dr. A. Harker from the Island of Rum, Scotland, and in basalts in Chhindwara and Nagpur as described by Drs. Fermor and Fox, in their paper on the Deccan Trap flows of Linga, Chhindwara district, Central Provinces (*Records*, Vol. XLVII, part 3, 1916). But though there is a close analogy between chlorophæite and the substance described here as palagonite, there is a wide discrepancy in the mode of occurrence of the two compounds. For, whereas in the two above examples the chlorophæite occurs in distinct vesicles or steam-holes in the lavas, the palagonite of Nagpur does not occur in such pre-existing cavities or vesicles, but as irregular patches within the solid rock formed by a process of decomposition.<sup>1</sup>

Under the microscope the palagonite spots present a dark, orange-coloured amorphous appearance with low refractive index.

When examined with a high power it does not appear to be absolutely amorphous and structureless, but shows concentric undulating layers of growth, each layer being minutely fibrous as in the bands of growth in chalcedony. It is in the main isotropic, but often shows

<sup>1</sup> Dr. Fermor has, however, obtained true chlorophæite from the Takli quarries, Nagpur: *l. c.*, p. 94. See also this volume of *Records*, pp. 127, 128.

feeble anomalous polarisation colours. Besides occurring concentrated in large massive bodies, *e.g.*, in the lacunæ, much of it is interstitial also, numerous white and brown opaque or cloudy patches being seen occupying the interspaces between contiguous felspar crystals with partly altered augite lying in them. This evidently is the beginning of the peculiar type of decomposition of augite, magnetite, and some original glass, which ultimately results in palagonite. The transformation can be seen in its early stages round the borders of augite plates and crystals; the latter together with magnetite, lose their shape, and at their margins becomes transformed into the deep brown translucent to opaque, amorphous, isotropic cloudy aggregate. These patches invade the interstitial glass, the augite, and the magnetite crystals. The felspars are altogether untouched in this process of alteration, preserving all their freshness and sharp boundaries intact, though they are penetrated by thin threads and streaks of palagonite along cleavage and other cracks. The palagonite so formed moulds around the felspar prisms in concentric zonal growth following all the angles and edges of the latter.<sup>1</sup> (See plate 11, figure 2.) Inside the palagonite masses are formed numerous small crystals of the olive-coloured granular zeolite referred to above as being probably chabazite.

Among the palagonite-bearing dolerite specimens there is a finer-textured more compact vesicular dolerite possessing structure and characters generally similar to the above. Hyaline palagonite (chlorophæite) filling amygdalæ. In this rock the palagonite occurs in a more hyaline form identifiable with chlorophæite, which has filled large true vesicles, 10-15 mm. in diameter. Besides these, however, there are present innumerable small dots and patches of palagonite dispersed through the rocks and looking at first like patches of interstitial glass, which in part they doubtless represent. These patches show very clearly the characteristic concentric bands or zones of growth towards their central parts and hazy and cloudy outlines where they pass into altered augite; but the boundaries are clear and strongly defined where they abut on felspars.

In both these rocks the point which is emphasized by a study of the micro-sections is that the palagonite, whether it occurs in the lacunæ of the rock, in the interstitial patches, or inside the augite plates, has been formed *in situ* and has not been collected by any

<sup>1</sup>In the Bhushawal lavas the felspars also have occasionally been replaced by palagonite; see page 133.

infiltration process in the manner of zeolites filling up pre-existing cavities. It is, however, capable of being so collected in the form of chlorophæite by a process of infiltration into amygdalæ when pre-existing cavities are found in the rock.

The substance generally designated palagonite has no established definition in petrology and therefore carries no exact significance when

**Palagonite : its nature and origin.**

used by different authors. In the term palagonite-tuff it signifies a variable lithoidal alteration-product of basaltic glass fragments, of an orange or green colour. Harker mentions it as a transparent coloured glass produced by the hydration of the more basic glasses such as basalts and augite-andesites. Zirkel ('Micro-Petrology of the Fortieth Parallel', pp. 273-275, 1876) evidently regards it as a similar product. Dana refers to it as a compound which formerly passed as a mineral species but which has no claim to be considered as such because of its indefinite, variable composition. B. K. Emerson<sup>1</sup> regards palagonite as a hydrated zeolitised glass, the transformation of the original glass of the lava being brought about by superheated water. Middlemiss recognised this difficulty of lack of exact definition when he used the term in describing some of the Rajmahal and Deccan palagonite-bearing traps. (*Records, Geological Survey of India*, Vol. XXII, part 4, pages 226-235.) With his description of the physical and chemical characters of this compound my results are in substantial agreement and I have used the term palagonite, with its obvious disadvantages, in describing this peculiar alteration-product of the Nagpur dolerite adopting his reservations. The relationship of chlorophæite to palagonite has been discussed by Dr. Fermor in his paper on the Bhusawal lavas : see pages 125 to 134.

With regard to the nature and origin of palagonite the following conclusions are offered :—

- (1) That palagonite is not a definite mineral, but an amorphous decomposition product of variable composition formed *in situ* within the rock.
- (2) That it is not the product of alteration of interstitial glass alone, but has been formed by the decomposition of the ferromagnesian constituents of basic rocks augite and magnetite, as well as of original glass, the feldspars remaining quite unaffected.

<sup>1</sup> *Bulletin of the Geological Society of America*, Vol. XVI, pp. 91-130, (1905).

- (3) That although in a few cases it fills up amygdular cavities like a zeolite, it is chiefly found in irregular patches formed in the rock by the decomposition of some of its constituents and simulating in shape, infilled lacunæ.
- (4) That the process by which palagonite is formed may probably be regarded as a variety of rock decomposition comparable to *serpentinisation*, *chloritisation* or *glauconitisation*.



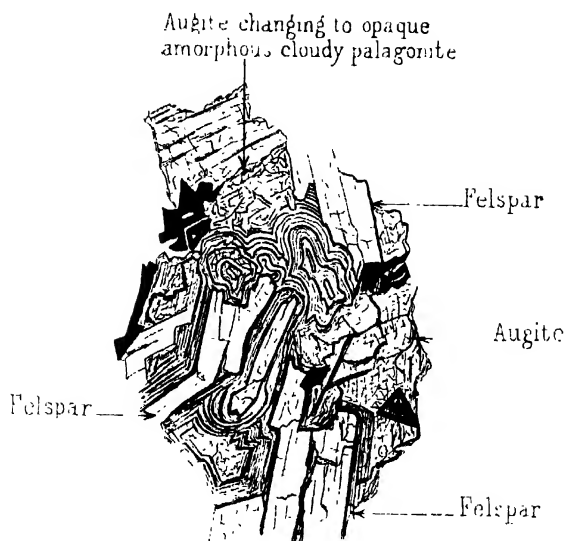


Fig. 1. Palagonite replacing Augite and moulding round Felspar. X 160.

Palagonite replacing Augite in situ

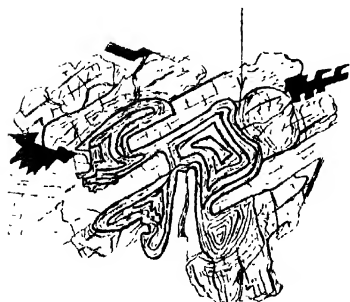


Fig. 2. Palagonite replacing Augite. X 160.

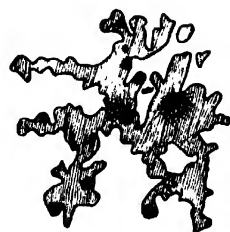


Fig. 3. A palagonite-lacuna (natural size), deeper pits indicated by shading. The walls of the cavity are formed of glistening vitreous felspar.

D. N. Wadia, del

G. S. I. Calcutta.













